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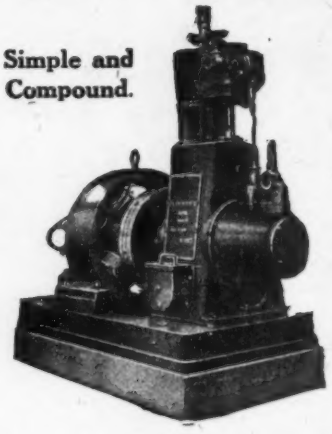

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ELECTRICAL REVIEW.

VOL. LXXXVII. AUGUST 6, 1920. No. 2,228.

ELECTRICAL REVIEW.

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THE GERMAN ELECTRICAL INDUSTRY.

THE doleful statements which are being made in Germany regarding the situation of the industries in that country are becoming so frequent that we are gradually reaching the conclusion that they are made for express purposes, namely, to coerce the native workmen on the one hand, and throw dust in the eyes of other countries on the other. If the statements were made by any other country with regard to its own industries—any country in the same situation as Germany—the Germans would call them *tendenziös*, that is, issued to create a definite but misleading impression. It is impossible, so it is declared, to deliver the specified tonnage of coal to the Allies; yet the production of pit coal in the first half of this year was 10,000,000 tons greater than in the corresponding period of 1919, while the daily output of lignite is greater than at any period in the existence of the country. The production of pig iron has recently so much improved as a result of larger imports of Swedish ore, that makers of castings are able to dispense with further imports of pig iron for the present. On the other hand, the steel makers are also apparently satisfied with the tonnage of their make of steel, but neither they nor the makers of pig iron desire any one to know the actual figures of production, as reliable statistics might impart too much information to other countries.

The electrical industry is less reticent, but one firm after another keeps the ball rolling in order to depict the situation both for the benefit of native labour and for foreign consumption. This time it is Director Henrich, of the Siemens-Schuckert Works, who recently addressed a general meeting of the "labour community" of the electrical industry. According to the reports of the proceedings, the director claimed that Germany provided 40 per cent. of the world's production of electrical manufactures in 1913, but at the present time the world importance of the Teutonic industry has been severely shaken owing to the rise of foreign competition, particularly American, whilst the inland prices now exceed the world's market prices, in consequence of the situation of the currency. New orders have recently declined by more than 50 per cent., and no customers are to be found for some products, the result being an increase in unemployment. The manufacture of cable, the meeting was informed, is in the worst position. During the first half of this year the production of cables throughout the country amounted to 190,000,000 marks, corresponding to a pre-war value of 9,000,000 marks, or only 30 per cent. of the value in former peace times for the same quantity of material, and the percentage is expected to fall to 25 in the current half-year. The situation is stated to be identical with regard to conductors and small motors, and in the installation department, especially as the "overland" central stations are unable either to proceed with new works or to undertake renewals and extensions of the stations owing to the threatened socialisation. In

the event of the nationalisation of these works, the speaker declared, the electrical industry apprehends a permanent decline in the orders from these sources; the charges for supply will become still dearer, and this will stop the further extension of the transmission of power. The tramways, too, afford a scarcely favourable outlook as their financial situation hampers the provision of new plant and rolling stock.

The glow lamp industry, to which the director next referred, is stated to have produced 70,000,000 lamps last year. Prior to the war, 50 per cent. of the output was exported; the exports have now fallen to less than 25 per cent., and foreign competition abroad is brisk. In the case of telephony, telegraphy, &c., orders are on hand for a year, and the position, therefore, is not unfavourable, although new orders are falling off, and foreign business is weak. All the electrical firms are seriously concerned in the matter of finance, and, despite increases in capital, companies which formerly possessed liquid funds now have to avail themselves of oppressive bank credits, some even having to consider the question of restricting their output. The speaker also referred to the difficulties in the matter of obtaining raw materials, and stated that the economic problems facing the industry could only be solved, if at all, in close co-operation between employers and workmen.

If the figures quoted by the director are correct—quoted before a meeting of representatives of the workmen in the electrical industry in general—the Germans would appear to have every reason for congratulating themselves on having done so well so soon after the conclusion of the war, instead of complaining about the situation as a whole. Apparently, Director Henrich did not inform his audience that the recent decrease in exports is due partly to the control exercised by Government Departments over export prices, and partly to the refusal of German firms to give binding offers, either in the matter of prices or time of delivery. If these departments did not insist upon the observance of minimum prices, with extras, surcharges, and other additions, the German "sale," or selling off policy in export markets, would not have come to an end for the time being, but dumping would have continued, whether profitable or otherwise, so as again to obtain access, or stronger access, to foreign markets pending the recovery of the industry.

EDAISM IN THE ANTIPODES.

From Australia there comes to hand an interesting report of a meeting held by the Electrical Traders' and Contractors' Association, of Victoria.

Mr. L. G. Hinwood, who appears to be a "live wire," submitted a paper on "Co-operation for Improvement in the Electrical Industry," and opens his statement by saying that "the electrical industry is probably the only one in Australia which is not making money to-day"; as in another great key industry, farming, it appears difficult to find anyone who will confess to working for anything beyond the benefit of the race. However, this Association of Australia does not seem to include the supply undertakings or manufacturers, but to consist of contractors and importers, many of whom no doubt deal in non-electrical goods also. Mr. Hinwood, who seems to have preached the gospel of mutual help for a number of years, complains of price-cutting, distrust, and lack of substantial support for his enterprise, all "growing pains" with which we at home have been only too familiar in the past, but which we now see giving place to a sounder conception of responsibility to the public and to fellow traders. The change reflects the greatest credit upon the faith and tenacity of our leaders and association organisers.

Says the speaker, with his finger on the weakest of weak spots:—

> To-day, if a central station has a shut-down, do we search for a good and legitimate reason as we would if the undertakings were our own? No. We are altogether too prone to adversely criticise, even to the consumer, with the result that he loses confidence, not in the central station, but in electricity, our livelihood. A competitor supplies or installs a piece of apparatus, or does some work which proves defective, or in some way gives trouble. Again, we have a tendency, perhaps more than a tendency, to criticise adversely, and again our livelihood is affected. Before we reach the maximum of success, we must realise very clearly that we, in the electrical industry, are all interdependent, and that one firm, or community of firms, cannot be affected for good or evil without the condition being very materially reflected in the rest of the industry.

This appeal for a wider outlook amongst all engaged in the service of electricity has been made very often, and there are signs that it is producing results.

The enthusiastic speaker dwells at length upon the magnitude of the co-operative work done within the American electrical industry, but he does not emphasise the support given thereto by such bodies as the National Electric Light Association of U.S.A., or the Association of Electrical Contractors. Work performed by such associations as these is invaluable; the considerable sums contributed to them have probably proved more remunerative than any other items of expenditure in the budget of their member undertakings.

Experience has shown that joint work of this kind is not only more remunerative than individual effort, but in addition it adds to the efficiency of individual effort, and enables each firm to cut waste and get the best result out of its expenditure on pushing its own particular business or specialities.

The best way to sell spades is to encourage a taste for gardening.

In theory, everyone believes in co-operative action for work of this kind, but in practice it has too often been the experience of far-seeing promoters to find themselves regarded as cranks whose efforts are rather grudgingly supported by contributions, which generally amount to something small in guineas, possibly less than the donor pays for his daily papers.

To-day every business man advertises in some form or other, and the time has come for a clear recognition of the fact that all particular and personal business-getting efforts, which are by their nature narrow and intensive, should follow behind a pioneering system of propaganda in favour of the industry generally.

If every trader would set aside a definite proportion of the money he is able to spend on business-getting for the support of such general pioneering, he would find the remainder of his expenditure more productive, his path easier, and, moreover, have the satisfaction of knowing that he was helping to create new markets for the future, and not merely exerting himself to secure the biggest share of an existing demand.

The speaker concluded with a few figures showing the possibilities of trade in Victoria; they are worth repeating:—

> Here are some interesting figures. In Victoria to-day there are 205,000 dwellings within the areas reticulated for electricity, but only 90,000 consumers. The manner in which the statistics are prepared do not enable us to determine how many of the 90,000 consumers are factories, theatres, &c., but let us assume that there are 20,000 of these. That would leave 70,000 dwellings wired for electricity—70,000 dwellings! How many of these are *fully equipped* electrically? I venture to say not one. Very well. That means that right now there is a market here in this State for at least:—
>
> 50,000 fan motors.
> 50,000 vacuum cleaners.
> 50,000 flat-irons.
> 50,000 kettles.
> 50,000 radiators.
> 50,000 washing machines.
> 50,000 table standards.
>
> Assuming the following selling prices:—
>
> | | | | | |
> |---|---|---|---|---|
> | Fan ... ... | £3 | 0 | 0 |
> | Vacuum cleaner ... ... | 15 | 0 | 0 |
> | Flat-iron ... ... | 2 | 0 | 0 |
> | Kettle... ... ... | 2 | 0 | 0 |
> | Radiator ... ... | 3 | 0 | 0 |
> | Washing machine ... ... | 25 | 0 | 0 |
> | Table standard... ... ... | 5 | 0 | 0 |
>
> This means that we have sales to the extent of £2,750,000 waiting for us to collect.

In addition, there is a balance of 135,000 dwellings waiting to be wired, at an average cost of, say, £20, making an additional £2,700,000 waiting for collection by us.

What are we, as a community, doing to convince these householders of the advantages, if not the necessity, of electricity? Not a thing. We fight like tigers amongst ourselves when an inquiry is served up to us on a silver salver, but individually or collectively we do nothing to create the desire among the people for electricity, which would mean more business for us. Are we going to continue these tactics, or are we going to help each other to take advantage of the wonderful opportunity awaiting us?

Although for some reason which one would be glad to hear, the cooking range is not included, the magnitude of the load to be secured suggests the urgent need for co-operation between the Association and the supply undertakings.

The Registration of Engineers.

Although the attempt of the Institution of Civil Engineers to secure powers to register civil engineers failed, owing to the opposition of the other engineering institutions, which believed that such powers granted to the Civils would endanger their own position, some good is likely to come of the effort. It is known, of course, that the Institution of Civil Engineers did not proceed with its Bill even to the first reading stage of the first House of Parliament, but although little has been heard of the nature of the conferences which took place between the Council of the Institution of Civil Engineers and the other engineering institutions—beyond the uncompromising determination of the latter to oppose the Bill in the form in which it was deposited in Parliament—yet it is probable that a far more comprehensive scheme of registration will be raised upon the ashes of the Civils' first Bill. In short, what is in mind is the formation of a body representing all classes of engineers on the lines of the General Medical Council, upon which all the engineering institutions would be represented. It would then be much easier to frame a scheme to place before Parliament for the registration of engineers, with powers to prosecute unregistered practitioners whose mode of business in any way suggested they were registered.

The terms upon which registration could be carried out would then be subscribed to by all branches of the engineering industry. For instance, we presume that the conditions concerning electrical engineers would be laid down by the Institution of Electrical Engineers, but they would be put forward and enforced by the federated council, by whatever name it was known. If such a closing of the ranks could be effected, and such a central body formed, a registration scheme would have a much better chance of getting through Parliament, for it would eliminate all opposition, so to speak, from within. That, however, would not necessarily imply an unopposed passage, although it would considerably strengthen the case for registration.

There would, nevertheless, still be many special cases to consider, because the case of engineers is not quite so straightforward as that of the medical profession or the law. There are large numbers of what might be called working engineers, now in business as such, whose standard of theoretical education would not enable them to pass the present examination tests set by the leading institutions, and if these tests were to be applied before registration could be obtained, and a man without registration was not to be allowed to call himself an engineer for the purpose of business, then considerable hardship would be effected, and a strong case could be made out for the class who, for the most part, are not members of any of the institutions, although their practical knowledge would probably far transcend that of many members of the existing institutions. Apart from this special case, a federal council of all engineers, working on the lines laid down in the Bill of the Institution of Civil Engineers, would add enormously to the status of the engineers, although a scheme of registration even then would not be easy to work out, having regard to the complexities of engineering, taken in the broadest sense of the term.

It is interesting to note that a federation of engineering societies is being organised in the United States on somewhat similar lines.

The Electricity (Supply) Bill, 1920.

The interview accorded by Mr. A. Neal, M.P., and the Electricity Commissioners to a deputation from the Association of Municipal Corporations, which we report elsewhere, is of considerable significance in several respects. The deputation supported the view put forward by the I.M.E.A. at the recent Convention—that the financial clauses of the Bill should be passed as a matter of urgency, to provide funds, or, at least, security which would enable the Joint Electricity Authorities to raise loans on good terms. As Sir Robert Fox pointed out, all the authorities in course of formation were up against this difficulty. But the reply of Mr. Neal afforded them little consolation.

In the first place, he hinted that the formation of Joint Electricity Authorities was going along so well that in all probability the District Boards would never be required. Nothing would be done with the Bill before the autumn—and it was clearly doubtful whether it would be proceeded with at all. The financial question was the rock that split the Bill in the House of Lords, and we infer from Mr. Neal's remarks that the Government is not at all anxious to court a repetition of that experience; he pointed out that public companies could raise money on the security of their undertakings, and urged that the Joint Authorities could do the same, while he addressed a special appeal to the corporations "to give the backing of their rate guarantees," and so help to frame the schemes. Once more the point was driven home—that if the municipalities were to obtain control, they must also find the money.

We take it then—though Mr. Neal was most carefully non-committal—that the present Bill will dwindle away to what he called a "short and non-controversial measure" (*i.e.*, obviously, one that deals neither with District Boards nor with finance), or will be dropped altogether; and that the component authorities of the Joint Electricity Authorities will be invited to solve the financial difficulty by pledging their rates, and/or undertakings, as security for such proportion of the necessary capital as their share in the venture justifies.

Incidentally, Mr. Neal pointed out that small isolated undertakings, which could neither derive advantage from inclusion in a joint scheme, nor confer any benefit upon the latter, need not be uneasy as to their future, for the existing Act imposed no obligation upon them to come in. Clearly, as when the Bill was before Parliament last year, many people raise objections, or ask questions, who have never troubled to read the provisions of the Act, which are perfectly clear on this point.

Who is Breaking the Law?

We wonder how many Electricity Supply Undertakings are aware of the obligation imposed on them under Section 31 of the recent Electricity (Supply) Act, 1919. This clause penalises any employé who breaks his contract of service, if by so doing he jeopardises the supply of electricity. The clause extends Section 4 of the Conspiracy and Protection of Property Act, 1875 (which up to the present has covered only gas and water) to the supply of electricity. But—and we wonder how many of those in charge of supply undertakings have carefully read the Section in question—there is an obligation also placed on every undertaker. This obligation is to post up a printed copy of the Section in some conspicuous place in the electricity works where it can be conveniently read by the persons employed; and as often as the copy becomes defaced, obliterated, or destroyed, to have it renewed with all reasonable dispatch. The penalty of not doing so is, "on summary conviction," some sum not exceeding £5 a day for every day during which the default continues. Moreover, there is a maximum fine of 40s. provided for anyone who injures, defaces, or covers up the notice. Some little time ago we commented on the desirability, if not the necessity, of all those in positions of responsibility in electricity undertakings making themselves familiar with the statutory provisions applying to their departments, and the present is an obvious case in point. *Verb. sat ing.*

SUBMARINE CABLE TELEGRAPHY.

A Rising "Cable-*Constant*": A Make-shift Term.

By EDWARD RAYMOND-BARKER.

Matter relating to signalling speeds through submarine telegraph cables is no novelty to readers of the Electrical Review, who will not have forgotten, *inter alia*, the leading article on "Speeds of Atlantic Cables" in the Electrical Review of June 24th, 1898, as well as the useful assemblage of data and closely knit argument afforded by the special article "Absorption and Cable Speeds" * in the same journal of June 9th, 1899.

During many years, various circumstances have kept the subject of "cable-constants" (so called) in the mind of the present writer.† Especially has this been so in recent times owing, principally, to seeming anomalies connected with the use of certain symbols, and of apparently not always consistent numerical equivalents.

Notwithstanding that the articles and books by Dr. John A. Fleming, F.R.S., Dr. A. E. Kennelly, and Dr. H. W. Malcolm, amongst others, have shed much light on the higher mathematical solutions applicable to these matters, the present writer will not be thought presumptuous if, in connection with a quite recent Press reference to developments due to modern current-*amplifiers* or *magnifiers*, he ventures to submit to the editors and readers of the Electrical Review one or two practical

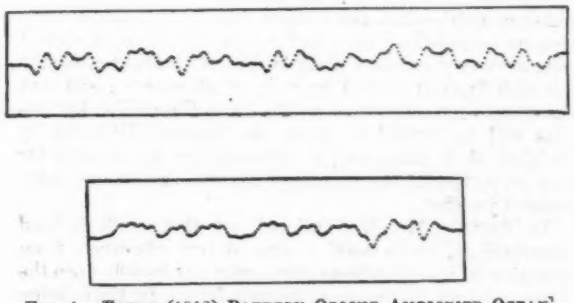


Fig. 1.—Early (1912) Pattern Orling Amplifier Ocean Cable Signals. Constant = 3×300 *l.p.m.* = 1200.

considerations relating to the so-called "cable-constant" as used by cable authorities and others in modern every-day practice.

The very useful and informative review, in the Electrical Review of June 11th, 1920, over the initials "A. F.," of Prof. Dr. J. A. Fleming's book "The Propagation of Electric Currents in Telephone and Telegraph Conductors," ‡ includes reference to "the Orling and Heurtley relays."

These relays are instanced by the reviewer as examples of improved submarine-cable current-receivers, which, in his opinion, have "badly upset" preconceived data regarding the "cable-constant" as referred to in Dr. Fleming's above-mentioned notable work.

Apt and pertinent as is this allusion to the current-amplifiers or magnifiers of Heurtley and of Orling (with which—by the way—the selenium current-magnifiers of Cox and of Dixon might have been bracketed) there is one sense in which the reviewer's words relating to the effect of these improved apparatus on the "cable constant" seem to have failed to coincide absolutely with historic practice.

With permission, the present writer will reproduce "A. F.'s" words on the subject in point:—

"... In the chapter dealing with the speed of signalling in cables reference is made to the 'cable constant,' which is defined as the product of the capacity of the cable, its resistance, and the letters per minute which can be sent through it. This, however, is a very arbitrary quantity, which has already been badly upset by such delicate receiving instruments as the Orling and Heurtley relays, to say nothing of the possibilities inherent in the modern amplifier." (Three-electrode thermionic oscillatory valve relay.) §

This constant cited by "A. F.," namely, the product of K R and (eligible maximum) *l.p.m.*, can hardly be accurately described as "a very arbitrary quantity."

Nor has this *constant*, during the past half century or more, been a *constant* absolute, and final up to the moment at which—somewhere about 1910—it was "badly upset" by the performances of the two "relays" mentioned by "A. F."

On the contrary, whilst during that period of time, the "cable constant" has, in the main, evinced a rising tendency indicating improvement in circuit efficiency on a cable of given K R, that same "cable constant" has varied according to attendant circumstances. To take one out of many instances, up to the present time, the cable constant for *duplex* working—other things being equal—has always been lower than with *simplex*.

Naturally the striking results (by inference) referred to by "A. F." as having been obtained by means of "the Orling and Heurtley relays," appear high up on the rising cable-constant curve as plottings, each of which, ever and anon, owing to some further improvement effected, is moved still further up the curve, the topmost limit of which is, as yet, unknown.

In a word, the term "cable-*constant*" has been a misnomer, and is but a makeshift. For, in truth, this term is applicable only (*a*) to comparison of two cables of approximately similar K R's and (*b*) to speed-test data obtained not only with certain apparatus among others of varied design and characteristics, but with that same apparatus adjusted and tuned up to the same given relative standard of efficiency; not necessarily uniform in degree, but relatively suitable to each particular degree of required periodicity.

In the late 'fifties, and early 'sixties, Thomson's (afterwards Kelvin's) mirror and siphon-recorder raised trans-Atlantic cable speed from something between three letters and seven letters per minute to quite 85 *l.p.m.*, this being equivalent to K W $\times$ *l.p.m.* $= 340 \times 10^4$—an old-time "constant" on the 1865 Atlantic cable.‖

Then the curve, to which Thomson's inspiration had given so good a start, continued to climb.

This upward progress, little by little, was, in a general way, maintained throughout the succeeding half-century, partly owing to increased experience and skill of an operating staff that has always taken a pride in getting the most out of the cables under given conditions, but principally due to a chain of improvements, a flash-summary of which may here be cited: The successive or cumulative adoption of signalling condensers at one or both ends of the cable, curb-sending, automatic trans-

* This article was from the pen of our esteemed contributor, Mr. J. Rymer-Jones, M.I.E.E.—Eds.

† See "The Speed of Submarine Telegraphy. A Cursory Historical Sketch," written, at special invitation of the Editor, by E. Raymond-Barker, for the *Electrician* of September 15th, 1916. Now—with articles by other writers—reprinted and published, in book form, by Messrs. Benn Brothers, Ltd., 8, Bouverie Street, London, E.C.4.

‡ Constable & Co., Ltd.

§ Regarding possible application of the valve amplifier as a relay for quasi-steady currents, *e.g.*, for submarine cable telegraphy, Captain L. B. Turner, M.A., in his Paper on the "Oscillatory Valve Relay" (I.E.E., January 30th, 1919) expressed the opinion that "the valve relay in this form must, it is thought, be adaptable to submarine cable working; but this is not an easy problem, and only preliminary trials have so far been made. . . ."

N.B.—The terms amplifier (Fr. *amplificateur*) and magnifier as applied to certain high-sensitivity receivers designed for use on submarine cables were in use before the appearance of the thermionic valve relays now called amplifiers.—E. R.-B.

‖ Derived from data in Chaps. II and III in Sir Charles Bright's most useful book of reference: "Submarine Telegraphs." Crosby Lockwood. E. R.-B. See also the *Electrician*, September 15th, 1916.

mission curbed and uncurbed, various methods of inverse-current working, shunted condensers, Mr. S. G. Brown's magnetic shunt, and various other forms of self-induction shunts, Dr. Muirhead's and others, connection arrangement of receiving apparatus as an oscillatory circuit with shunted condenser, also resistances, inductive and non-inductive; above all, the advent of current amplifiers or magnifiers. Each one of these improvements contributed its quota towards the increase of the "letters per minute" factor in the expression K W *l.p.m.* or "cable constant."

The numerical equivalent of this last-mentioned expression has thus risen to considerably over 1,200 (millions); indeed, recent experiments on the cables have rendered certain the attainment of a "cable constant" of well nigh $2,000 \times 10^6$.

To digress for a moment. So long ago as in 1912 was the "cable constant" 1,200 attained by a early-pattern Orling jet relay, which, in experimental trials over an ocean cable of K R $= 4 \times 10^6$, recorded signals at very nearly 300 letters per minute, which speed happened to be *the maximum limit of the particular transmitter used*. The fact that this constant of 1,200 has often been referred to in technical articles and books adds interest to inspection of the accompanying fig. 1, which shows some of the actual received signals there referred to; actual words being: "*Cable company*" and "*His sister.*" Any cable man sees, at a glance, that had still faster transmission been available, the reception would have greatly exceeded 300 *l.p.m.* with easily decipherable signals. The "fly in the ointment" was, in those days, the inability of this sensitive reception (except under semi-suicidal modification) to stand the shock of *duplex* out-going signals. This phase of the matter—now satisfactorily settled—will be dealt with further on in this article.

When considering these "cable constants," one does not lose sight of the circumstance that, with regard (1) to the expression K W *l.p.m.*, the higher the K W factor (say 8×10^6) the more easily is a high constant attainable, for, in this case, the mechano-electric necessities do not involve any ultra-high-speed movements of mechanism. Whereas, (2) with a low or medium K R factor (say 2×10^6), before one can reach the high-speed constant attained in the first case, transmitting, receiving, and relaying electric mechanisms have to be brought into play under conditions of exceedingly high instrumental stress—conditions under which only very high-class design and construction can ensure stability, and time-uniformity of operation.

For example, let the K R in the former instance $= 8 \times 10^6$. In order to attain a "speed constant" of $1,600 \times 10^6$, *l.p.m.* must = 200 which, at 4 contacts per letter (in round numbers), = 800 contacts per minute = about 13 contacts per second. Whereas on a K R of 2×10^6, in order to attain a "speed constant" of $1,600 \times 10^6$, *l.p.m.* must = 800, that is 3,200 contacts per minute = about 53 contacts per second—a high figure, though not impossibly so, especially under conditions as advocated by Major-Gen. George O. Squier, Chief Signal Officer, U.S. War Department—namely, that submarine cable transmission should be effected through the medium of an unbroken single-phase alternating current of the sine-wave type using three different amplitudes severally for spaces, "dots" and "dashes"* a style of transmission excellently adapted to *duplex* conditions, owing to the wave-like shape of the transmitted alternations, as compared with the customary square-topped current-impulses so awkward for *duplex*.

The foregoing comparison of two highly divergent K R's is merely an illustration of one of the anomalies of the K R law, the shortcomings and limitations of which have been so clearly summarised and explained by Dr. Malcolm in "The Theory of the Submarine Telegraph and Telephone Cable," pp. 232-241, also p. 259.

Clearly, then, it is desirable that the expression K R *l.p.m.* as a "cable constant"—for ordinary practical office use—be replaced or supplemented by some more comprehensive expression which will take into account the varying relativities severally between "K R" and "l.p.m." factors. At the present time, if "A" tell "B" that a new magnifier brings about a "speed constant" of, say, 1,800, B, before he can estimate the nature or extent of the feat involved, has to ask "Over what K R?"

(*To be concluded.*)

* See the ELECTRICAL REVIEW, July 30th and August 6th, 1915.

TRANSPORT PROBLEMS IN PARIS.

IT was recently mentioned that a scheme was being promoted in Paris for the amalgamation of the transport undertakings on the surface in the capital and its vicinity, and it was suggested that the working of the combined companies would be entrusted to an operating company. The details of the project have now been put forward in a report prepared by the Prefect for the consideration of the Paris Municipal Council, and the General Council of the Department of the Seine. The public authorities and the Commission for the reorganisation of transport services in common, are of opinion that the undertakings of the six companies concerned should be purchased in order to unify the system of working, which would be entrusted to a company in which the authorities would be also interested. To amalgamate the companies and effect a settlement of the purchase price all at once would necessitate the flotation of a large loan. In order to overcome this difficulty the idea has been conceived of proceeding with the redemption by the adoption of a system of annuities. These would be spread over a period of 30 years, and in return the obligation would be placed upon the companies to surrender their movable and immovable property forming the public domain included in the concessions, or forming part of their private domain. On the other hand, the companies would retain their cash funds, portfolio securities, and banking accounts, whilst the stocks would be purchased by the Department of the Seine at the invoice prices. As a result of the negotiations the companies have formulated their claims for compensation on an annuity basis. The largest undertaking—the Compagnie Générale des Omnibus, which is chiefly a tramway concern—asks for an annuity of 20,000,000 fr. on combined share and loan capital of 263,000,000 fr.; the Compagnie des Tramways de Paris et du Departement de la Seine applies for an annual payment of 6,500,000 fr. on capital of 78,000,000 fr.; the Compagnie Générale Parisienne de Tramways, an annuity of 5,000,000 fr. on 65,000,000 fr.; the Tramways de l'Est Parisien, 4,500,000 fr. on 41,000,000 fr.; the Chemins de Fer Nogentais, 2,960,000 fr. on 20,000,000 fr.; and the Tramways de la Rive Gauche an annuity of 6,500,000 fr. on capital of 12,000,000 fr. The amount of the annuities would suffice for the payment of interest on, and the redemption of, the loans, and provide 6 per cent. for the interest and redemption of the share capital. If the six companies are able to obtain the grant of the annuities in question, it is probable that they will be glad to withdraw from the transport business, having regard to present difficulties in working and the uncertainty of the future. Whether they will unite to constitute an operating company with the object of competing for the working concession which is to be granted in the event of the amalgamation of the undertakings being carried into effect, so as to secure uniformity in working, administration, and in the formation of new connections—well, this is quite another matter. The companies certainly have before them the experience of the Compagnie Parisienne de Distribution d'Electricité, which is a combination of the former Secteurs, or local companies, and in whose gross revenue the Municipal Council participates without sharing the risks of the shareholders; and they also have within their reach the similar experience of the Metropolitan Railway and the Nord-Sud Railway, in which the financial advantages are all on the side of the local authorities.

THE SHEPHERD'S BUSH—EALING ELECTRIC RAILWAY EXTENSION.

The Central London electric railway service over the Great Western Railway extension from Wood Lane, Shepherd's Bush, to Ealing Broadway, was officially inaugurated last week, when a special inspection train, carrying directors and officials of the Great Western and London Underground Railway Companies and a party of guests, was run from Liverpool Street to Ealing Broadway and back to the British Museum. After the trip luncheon was served at the Holborn Restaurant, the Right Hon. Viscount Churchill, G.C.V.O., chairman of the G.W.R. Co., being in the chair.

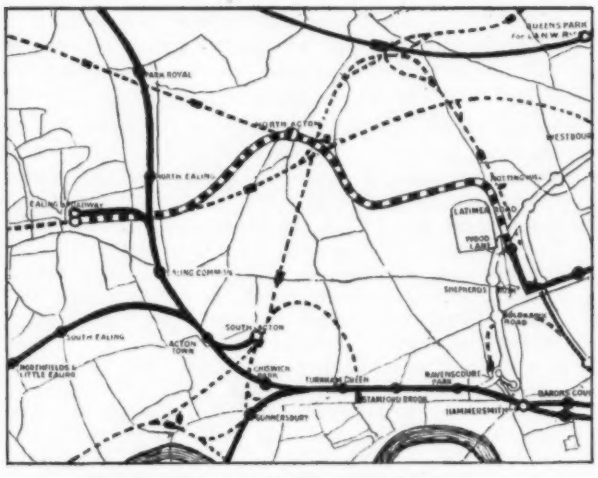


Fig. 1.—G.W. and C.L. Railway Extension.

It will be remembered that the Central London railway was opened for passenger traffic on July 30th, 1900, between Shepherd's Bush and the Bank. During the first six months of operation over 14½ million passengers were carried over the line; that number increased annually until in 1919 the passengers carried numbered nearly 48½ millions. On July 27th, 1912, the extension from the Bank to Liverpool Street was opened to traffic. In 1905 the G.W.R., by Act of Parliament, obtained authority to construct the new line, and in 1911 another Act gave the C.L.R. powers to connect up with the new line, and run its trains through to Ealing.

Work was commenced at the beginning of 1913, and good progress was made, but the incidence of the war delayed the completion of the undertaking, particularly in so far as the electrification was concerned, it not being possible to secure the necessary equipment. It is, therefore, to the credit of all concerned that the new service has been inaugurated so soon after the Armistice.

It is proposed to run a 10-minute service on week days between 6 a.m. and 8 p.m., and between the latter hour and midnight a 14-minute service; on Sundays a 15-minute service will be available. The new line will develop the previously badly-served districts through which it passes, and will afford residents a more direct route to the West End and City of London with connections to all parts. It should also considerably relieve the District Railway from Ealing during the busy portions of the day.

The extension, which is 4 miles 22 chains in length, the C.L.R. from Wood Lane to Liverpool Street being 6 miles 76 chains long, forms a connection with the West London line near the Uxbridge Road, and is available for use by G.W.R. passenger and goods trains; freight traffic had already been conveyed over it by G.W.R. steam trains prior to the commencement of passenger traffic on August 3rd. The new line, the location of which is indicated in fig. 1 by the thick black and white line, from Ealing Broadway parallels the G.W.R. main line for about half a mile, after which it turns northwards towards the G.W.R. London-Birmingham line, adjacent to which it pursues its course to Old Oak Common, running under the G.W.R. lines at that point and proceeding along the west side of Wormwood Scrubbs. Physical connection is made with the C.L.R. at Wood Lane station.

Additional platforms have been constructed at Ealing Broadway and Wood Lane stations, and a new intermediate station has been built at East Acton.

The electrification of the new line has been carried out on the same principle as is already operating on the Central London Railway, namely, what is known as the three-rail principle, with centre positive conductor rail and running rail return. Electricity is supplied from the Great Western Co.'s power station at Park Royal. The supply is three-phase at 6,600 volts, and is transformed and converted to 600 volts D.C. at Old Oak Common sub-station where the supply to the line is given. In addition to a supply for traction purposes a single-phase supply at 460 volts is provided for the electric signalling system.

The working of the trains is safeguarded by the provision of automatic signalling, the line being divided into sections, eight on the down road, and nine on the up road, the longest section being about 1,100 yards, thus enabling a service with the minimum of interval to be run when necessary. There are three signal boxes. The Wood Lane Junction box controls a fly-over junction, fig. 4, connecting the West London and West London extension lines to Addison Road and Clapham Junction south of the Thames. The signal box works the facing points of the junction, mechanically and electrically controls the necessary signals for the protection of the junction. The North Acton box controls the junction between the new line and the Great Western direct line to Birmingham. The interlocking apparatus required for the new terminus is operated from the District Co.'s signal-box at Ealing Broadway, and is of the electro-pneumatic type, there being six sets of points. All signals are of the three-position type, worked in the upper quadrant, fig. 4, which are controlled by A.C. track circuits.

The signals are put to "danger" on the passing of a train, and do not alter in position until the train has cleared the track circuit of the first section ahead, when the signal-arm works automatically to the 45 degrees position. Upon the train clearing the second section ahead, the signal assumes the vertical position. At the junctions the signals are controlled by the signaller in addition to the track circuits. In each signal-box there is an illuminated diagram, by means of which the signalman is able to follow the movements of trains over the sections of line applying to the signal-box. At each signal a train-stop is provided, working in conjunction with the signal-arm, which on being passed in the "danger" position automatically applies the brake on the train. For foggy weather, repeating-

Fig. 2.—Looking East from Ealing Broadway.

light signals are provided along the line at a distance of 200 yards from the signals.

The signal work has been carried out by the Mackenzie Holland and Westinghouse Power Signalling Co., under the direction of the signal engineer of the Great Western Railway.

The trains consist of six cars—two motor-cars, and four trailers. The latter are standard C.L.R. stock, while the motor-cars were specially designed for this extension. The control equipment supplied by the B.T.H. Co. is of the relay automatic type. The normal position of operation is to place the controller at once to the full-on position when starting a train. The contactors are then picked up in their correct sequence by the current-limiting relay, which operates as soon as the motor current has dropped to a pre-

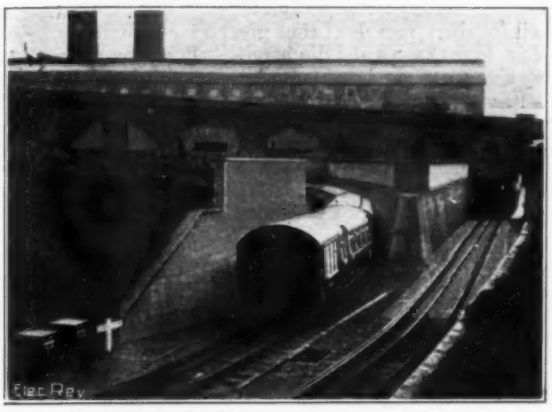


Fig. 3.—Approach to Wood Lane, looking East.

determined value. The relay consists of two shunt coils and one main coil; the latter carries current equal to that of one motor only.

The actuating coils of the contactors are energised through one or other of the two shunt coils in a manner such that, if one is energised through one shunt coil, the next one to close will be energised in series with the other shunt coil. The two relay shunt coils act on two plungers controlled by gravity. Each plunger, when in its normal position, closes a disk switch in series with the other shunt coil; but when raised (due to its coil being energised) opens this switch. Thus, when one of the plungers is raised, the shunt coil acting on the other cannot be energised because of the break in the circuit produced by the above-mentioned switch, but although it is the control current that raises the plunger so as to produce this break, it is the current passing through the main coil which maintains the break and the plunger is not released until this current has dropped to the pre-determined value. Then the plunger falls and closes the switch, which completes the circuit for the next contactor coil to be energised.

The principle underlying the method of control adopted in connection with the current-limiting relay is that after a contactor has been picked up, as described above, its coil is immediately transferred (by means of inter-locks) to another wire. There are thus essentially two operating wires, the picking-up wire and the retaining wire, although other wires are introduced for forward and reverse, circuit-breaker setting, &c. As there are no main bus lines down the train a potential relay is fitted on each motor-car, which drops all contactors on that car when the motors lose current. This is necessary, because when no current passes through the main coil of the current-limiting relay it ceases to exercise its control over the rate of picking-up of contactors.

The controller has four forward points and two reverse (series only), of which Nos. 2 and 4 are running points, where all resistance is cut out. A useful provision is that, if in the course of the automatic notching up the controller handle is brought back to the first or third notch, as the case may be, the automatic closing of contactors is stopped, but those already closed are kept up. The working of the safety button on the controller handle differs from the C.L. Railway standard in that the safety button cannot be released, except when the handle is at the off position. If, however, the handle itself be let go, it flies back to the off position, when current is instantly cut off, and the brakes applied throughout the train. Another safety device is the control circuit governor. By interrupting one of the control circuits it prevents the train being driven forward unless the train pipe of the Westinghouse brake is charged with air and the trip cock is cut in.

Each motor-car is fitted with two G.E. 212 motors of 240 H.P. geared for a free-running speed of 35-40 M.P.H. The brake equipment is of the Westinghouse type with improved triple valves on the motor-cars and quick-acting triple valves on the trailers. The brake blocks are of unchilled cast-iron. The air-compressor is of the B.T.H. Co.'s C.P. 28a type. The motor-cars are provided with a covered vestibule at the trailing end and middle doors. The control of the latter is similar to that described in our issues of April 16th and 23rd, 1920, in connection with the new Bakerloo stock.

The interior steel panels of the motor-cars are painted a light brown to tone with the colour of the moulding, &c., which is of teak or steel, painted to match. The lamp fittings and ends of cross seats are finished in oxidised bronze; other fittings are of aluminium alloy. The ceiling of the arched agasote roof is enamelled flat white. With regard to ventilation, in addition to the ordinary drop lights, an air duct with perforations runs the whole length of the motor-car, and is open to the air at the ends.

The motor-cars are constructed mainly of steel, with some teak interior finish. The sole bars consist of 12 in. × 4 in. × 0·6 in. bulb angles, upon which the body framing is built up. The motor trucks are built of plate and angle iron. The trailer trucks are built up of pressed-steel sections, and are fitted with the ordinary laminated side-bearing springs. The motor-cars were constructed by the Cammell Laird Co. from diagrams drawn by the Ealing Common Drawing Office of the Underground Companies.

The leading dimensions and weights of the trains are as follows:—Length overall, 47 ft. 9 in.; width over body, 8 ft. 9 in.; total height from rail, 9 ft. 3½ in.; centres of bogies, 29 ft. 6 in.; diameter of motor wheels, 36 in.; wheel base of motor bogie, 6 ft. 8 in.; diameter of trailing wheels, 29 in.; wheel base of trailer bogie, 5 ft. The weight of car completely equipped is—motor end, 22½ tons; trailer end, 9½ tons, the weight of a six-car train (unloaded) being 128 tons.

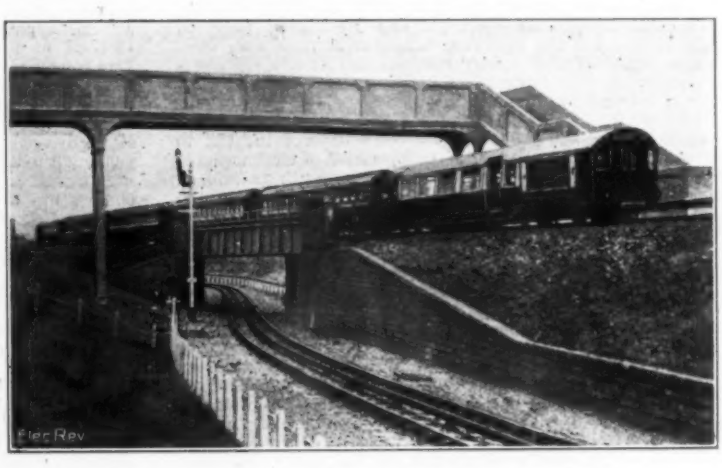


Fig. 4.—The Fly-over West of Wood Lane Station.

The first ordinary passenger train over the new line left Ealing Common station at 6 a.m. on Tuesday morning last, the complete journey to Liverpool Street occupying 35 minutes. At a later date it is proposed to build two additional intermediate stations, at East and West Acton respectively.

THE EFFICIENCY OF LEAD ACCUMULATORS.

By T. E. GREEN.

Accumulator efficiency can be measured in two ways; either by what is known as the quantity efficiency, or the energy efficiency. The usual method of calculating these is as follows:—

Q (Quantity efficiency) = Output in ampere-hours/Input in ampere-hours.

E (Energy efficiency) = Output in watt-hours/Input in watt-hours.

Of these two expressions, the latter is the more accurate, because it includes the voltage at charge and discharge, which the former ignores altogether. For this reason also, E will always be smaller than Q. When calculating the output and input, it is necessary to take the output first, and then the input, which is required to complete the equation, *the amount necessary to bring the cell back to exactly the same condition as before discharge.*

It is, of course, a well-known fact that the capacity of cells varies with the rate of discharge and the temperature. We may, for the present, safely neglect the latter. The variation of capacity with the rate of discharge is shown in fig. 1. Now, what is the effect of variation of discharge rate (or capacity), on the efficiency of a cell? This is also shown in fig. 1, and it will be seen from this curve that the higher the rate of discharge, the lower is the efficiency of the cell.

Undoubtedly the most efficient type of battery is the floating battery; repeatedly charging and discharging a cell for short periods of time gives a much higher efficiency than long charges and discharges. Referring to fig. 2, we see that for, say, one minute charge and discharge we get an efficiency of about 94 per cent., whilst for four or five hours' charge and discharge the efficiency is only 76 to 74 per cent.

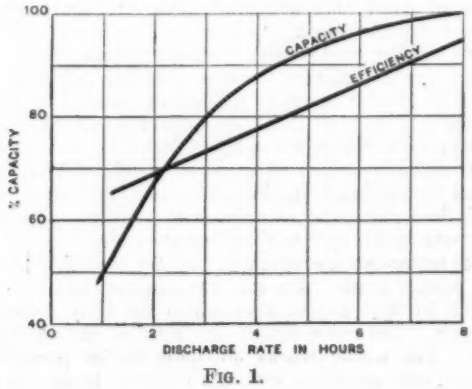


Fig. 1.

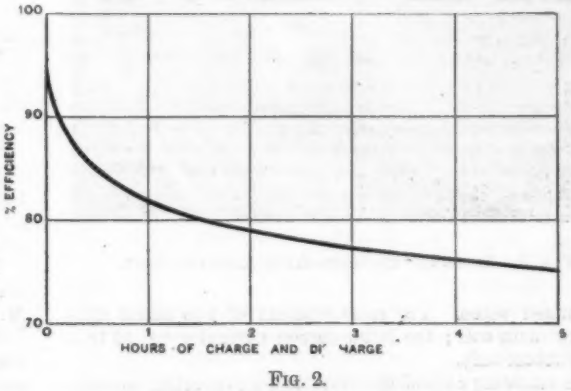


Fig. 2.

ELECTRICITY IN MESOPOTAMIA.

We are indebted to Lieut.-Col. S. H. Bridcut, O.B.E., A.M.I.E.E., Director of Electrical and Mechanical Services, Mesopotamia, for the following information respecting electrical activities in that country. As an example of British progressiveness against tremendous handicaps this will no doubt prove of interest to our readers.

"The original E. and M. Section of the Royal Engineers in Mesopotamia was started in the early days of the war to undertake all arrangements for the provision of electric lights and fans and water supplies for the troops at Basra and on the lines of communication. Its main functions were the provision of these necessities for the hospitals.

"Towards the end of 1916 the activities of this unit were largely extended. Under the late Brig.-General Stokes-Roberts, C.B. (Director of Works), and Col. J. S. Pitkeathly, C.V.O., C.B.E., D.S.O. (commandant of the unit), an extensive programme for the provision of adequate arrangements for electric lighting and fans, pure water supplies, ice supplies and refrigeration for the whole force, and extending up to divisional areas, was undertaken. The accomplishment of this programme was an important factor in the vast improvements that were made for the health and comfort of troops in a country notorious for its evil summer climate.

"The scope of the unit continued to grow until it ultimately embraced such works as the erection and maintenance of a large number of irrigation pumping sets to improve the food supply in the country, the erection of flour mills and baling presses for hay and *bhoosa*, the assembling and maintenance of road rollers, and the working of a small oilfield that had been commenced by the German engineers with the Turkish Army. Workshops at Basra and Baghdad were considerably enlarged so as to be able to deal with all classes of electrical and mechanical repairs, and a third workshop was started at Mosul.

"In November, 1919, Major-Gen. E. H. de V. Atkinson, C.B., C.M.G., C.I.E., took charge of the combined appointment of chief engineer and secretary to Government in the Public Works Department. Under his charge the electrical and mechanical section was made a separate department, with Lieut.-Col. S. H. Bridcut, O.B.E., as Director.

"The E. and M. directorate now control the electrical and mechanical services throughout the country. At Basra the power supply extends seven miles up the river, and on both banks, and provides energy for a large number of electric cranes and cargo-handling devices. At Baghdad the electrical distribution covers a very large area, which includes power supplies for railway workshops and a Government flour mill.

"Small power houses are in operation at numerous other stations in the country, including Amara, Kut, Nasiriyeh, Dewaniyeh, Hilla, Tekrit, Baiji, Kirkuk, and Mosul, so that the essential comforts of the electric fan are enjoyed by practically all British *personnel* in Mesopotamia.

"At Basra and Baghdad, the power station plant is steam driven from oil-fired water-tube boilers, and at Dewaniyeh small marine type steam sets, with oil-fired vertical boilers are installed. At all other stations, internal combustion engines are used as prime movers.

"The E. and M. directorate have erected and maintain most of the water supply services throughout the country. By central control, uniformity of treatment of water is ensured, with the result that water-borne diseases have now almost disappeared. Close upon four million gallons of water is daily pumped, chlorinated, and piped to consumers.

"The department maintains an up-to-date laboratory under the control of a qualified chemist. This branch is responsible for the control of water treatment, and for the examination of all fuels and materials used by the E. and M. services.

"Ice and refrigeration is an important side of E. and M. directorate activities. During the hot weather an average of 80 tons of ice is produced daily, and refrigeration barges and stores can maintain up to 1,500 tons of frozen meat. The large ice plants at Basra and Baghdad are electrically driven.

"With the establishment of a settled Government in Mesopotamia, it is expected that a considerable number of the electrical and mechanical works put into this country by the Army will ultimately be taken over by the civil administration and developed for the benefit of the inhabitants. When the British came to Mesopotamia they found a barren land that had hardly known any of the benefits of modern engineering science. Within the short space of five years they have given it a start unrivalled in modern history, and with the sweeping away of the lethargy that characterised the Turkish Administration, Mesopotamia may again develop into a great country in which the electrical and mechanical engineers will play an important part."

Lieut.-Col. Bridcut wishes it to be known that all inquiries regarding these and future developments, and all catalogues, &c., should be addressed to him as Director of Electrical and Mechanical Services, Office of the Chief Engineer, Baghdad.

NORWEGIAN WATER POWERS.

As in many other countries, so in Norway has the scarcity of coal owing to the absence of national coal deposits brought about a serious state of affairs, and Norwegian ships are having to proceed to different parts of the world in order to fetch coal where and when coal is obtainable. As a consequence, it is said that hundreds of millions of Norwegian crowns (kroner) are being unnecessarily squandered at a time when, if the past action of the State had not destroyed private enterprise, the country would be independent of foreign coal supplies, except for bunkers, and Norway would be covered with a network of transmitting and distributing mains, supplying energy for lighting purposes and for all the industrial needs of the country. The indictment brought against the State by *Norges Handelstidende*, of Christiania, for its action with regard to the water powers is very strong. Ten years ago, the newspaper states, far-sighted men foresaw on the one hand the enormous economy which would result from the extensive utilisation of the national waterfalls, and on the other the dangerous situation in which the country would be placed in the event of British coal supplies becoming less easily obtainable than formerly. Some of the most competent Norwegians took up the question with the greatest energy ten years ago, and if they had been permitted to continue the work as it was begun, the country would to-day have had at its disposal so much electrical energy that very few industries would have been dependent upon coal.

Unfortunately the State placed itself in the way. The Storting (Parliament) passed a concession law which went too far in the conditions imposed upon the utilisation of water powers. In the opinion of the newspaper the rigorous law was exercised in such a manner that it stopped private enterprise in this direction, and it even arrested municipal efforts. Not only does the law put the greatest obstacles in the way of the beginning and carrying out of work with generating stations, but it can also be applied to existing works in such a manner as to deprive the owners of the economic results, and even cause them great losses. This was the case, the newspaper remarks, with Mr. Blakstad, who was practically compelled to sell the Hogefoss works at a heavy loss, whilst he has been specially hampered with the Tysse works. These and other cases have shewn that the State not only has complete control over those who utilise water powers, but also that it uses this power to their detriment. Under these circumstances it is obvious that no one will invest private capital with such a law suspended over their heads, and with an administration ready to exercise the law to one's injury, at any time whatever; to invest money would be equivalent to throwing it away.

The Effect of State Control.

On the other hand, the State itself has proceeded to purchase and utilise water powers. But there is only one thing to say about the State's supply of electrical energy—practically no energy has yet been supplied. Excepting the Glomfjord works there is practically little of electric power stations to be seen. In the case of the Norefalden, where the State has had possession for over ten years, the work has reached a beginning. The consumers in the Buskerud's district have waited all this time in vain for a supply. In the meantime the costs of erection and equipment have increased by at least three times since the original step taken by the State; but the communes receive no compensation for having been held up with promises all this time; they must accept the situation as it is to-day and pay for energy at the price represented by three times the former cost of construction. It remains to be seen whether anything will ever be completed with the Norefoss, but in any case all those who have been fed with promises of power from this works have hitherto been bitterly disappointed, and this is the case wherever the State proposes to deal with water powers. Some of the communes have built works, mostly of small dimensions, but the results have often been poor. The case has been more satisfactory where existing works have been acquired by the communes. The municipal council of Christiania unfortunately neglected to acquire the Kykkelsrud works when offered to it; the council is now erecting works in the Solbergsfoss, the supply from which will be excessively dear. In conclusion, the newspaper states that the result of Government intervention has been that the State has placed its paralysing hand on water power utilisation in the less costly times, kept prospective customers waiting, and prevented private enterprise, whereas if the latter had been allowed to develop it would not now be necessary to send ships all over the world in search for coal.

The Smelting of Ore Concentrates.

A later issue of the same Norwegian newspaper contains a report of an interview with Mr. Ragnvald Blakstad, dealing with the identical and incidental problems. Discussing the question of the position of Norwegian currency in international exchange, Mr. Blakstad is reported to have stated that the unfavourable situation was due to the unsatisfactory trading balance; the Norwegians were constantly importing, but the exports were at a minimum. For instance, they paid for and imported from 300,000 to 400,000 tons of iron and steel per annum, notwithstanding that they lived in one of the richest iron ore countries in the world. It would easily be possible, in his opinion, to produce from 4,000,000 to 5,000,000 tons of iron ore concentrates per annum, and with the assistance of the water powers make sufficient steel to meet the requirements of the country. He had in Tyssedal an ironworks with furnaces completely ready for smelting iron concentrates by electricity, but could not get permission to carry on the work. Yet year in and year out thousands upon thousands of horse-power were flowing into the seas without being utilised.

The Cost of State Inactivity.

After confirming the statement that by means of a rational development of the water powers it would be possible to render the country independent of imports of supplied. Excepting the Glomfjord works there are hardly any electric power stations to be seen. In the case of loans were unobtainable for the purpose, and as a consequence no power was available. It had long been proposed to erect works in the Numedalslaagen for supply to Christiania, but everything went slowly. If the authorities were not willing to utilise power from Tysse, which was offered to the State and Christiania in 1918, the State should see that power was transmitted from Numedalslaagen as speedily as possible; the work could be completed in the course of two years.

The speaker's offer to supply the Ostland with electrical energy received no response from the State authorities. He offered to defray the cost of mains on condition of being given permission to supply Christiania and Ostland with power for a period of 20 years, at the expiration of which the mains would pass into the possession of the State free of charge; but the authorities were not agreeable to the proposal. It would have been possible for him to deliver 100,000 kw. from Tysse to Christiania at 90 kr. per kw., or 68 kr. per horse-power. As compared with this offer the power from the Solbergsfoss works, when it was once completed, would cost about 600 kr. per horse-power delivered in Christiania. In conclusion, Mr. Blakstad expressed the opinion that the only reasonable and economic method was to devise a scheme of electrification for the whole of the country, under which the most favourably situated water powers would be utilised for large works having connection with the existing network of mains; and in this way it would gradually become possible to make extensions so as to cover the whole of the south and east of Norway.

SLEEPERED TRACK AT BIRMINGHAM.

The Tramway Department of the City of Birmingham has just completed the construction of a tramway on the sleeper principle at Salford Bridge, Erdington, situated about 2½ miles from the centre of the city. The scheme was sanctioned by Parliament in 1914, and consists of about three miles of double track, of which nearly two miles has just been opened.

The track commences at the junction of Gravelly Hill and Slade Road, and finishes at Holly Lane, close to the new factories recently erected by the Dunlop Rubber Co.

It is the intention of the city authorities at some future date to make this new road 103 ft. wide, with a track laid on sleepers in the centre and a carriageway on either side, a system which the road-using public are already beginning to appreciate.

It was decided to construct the whole of the permanent-way by direct labour, without the intervention of a contractor, and judging from the quality of the work the tramways committee has no cause to regret the decision.

The construction of the new road has not presented any engineering difficulties except at one point where a bank of red sandstone about 30 ft. high near Gravelly Hill had to be cut through. This bank is about 300 yards long, and the rock was first loosened by blasting and then loaded into tip wagons and carted to low-lying land in the vicinity.

In laying the permanent way the ground was first excavated to the required depth, and owing to its boggy and water-logged nature a 6-in. perforated drain pipe was laid on concrete in the centre of the clearway at an approximate depth of 3 ft. 8 in. from the top surface of the rail. The trench containing the pipes was filled up to the correct level with 2½-in. slag, and the excavation, which was approximately 16 ft. wide to allow for a double track, was then hand pitched with 9-in. blast furnace slag obtained from the Black Country, and this was covered to a depth of 3 in. with 2 in. slag. The sleepers are of creosoted deal 7 in. by 9 in. by 4½ in., and are

spaced 2 ft. 5 in. apart centre to centre. On these were laid special rails having a B.S.S. No. 4 head, so that they would easily fish up to the existing lines. The rails, which are 5 in. deep with a 5¼ in. flange, were spiked to the sleepers by the use of dog spikes. The joints were then fished with ordinary fishplates with four bolts to a joint. The holes in the rails are oval to allow for expansion, and a space of ¼ in. is left at the joints for this purpose. Flexible wire bonds, 4/0 S.W.G. having ⅜-in. pin terminals, were fixed at each joint, and cross bonds and intercross bonds at the usual intervals. Points and crossings of the Birmingham standard patterns were supplied by Messrs. Hadfield's, Ltd., of Sheffield.

The road, after the rails had been fixed in position, was filled up to the sleeper level with 2 in. slag, and will be boxed up eventually to within 2 in. of the rail level with this material, and then covered in to the rail level with clean hard engine ashes, of which plenty are available on the site. Tie rods fixed approximately 12 ft. apart were used to line up the road.

The road has only slight gradients, the greatest being 1 in 70, and the sharpest curve is of 300 ft. radius. The track only crosses two public roads, the remainder being through open country and fields. Where it crosses the roads the usual Birmingham standard method of construction is employed, and to conform with the existing paving of the road, plascom macadam paving is used.

The construction of the track was commenced by the permanent way department of the Birmingham Corporation Tramways on January 13th, 1920, and, notwithstanding the abnormally wet weather which prevailed, and the difficulty of obtaining material, the work was finished and the traffic running on May 13th, 1920, four months from the commencement.

Fig. 1.—General View of Track Approaching Terminus.

Fig. 2.—View of Track Looking East.

THE POSSIBILITIES OF RAILLESS ELECTRIC TRACTION.

Although railless electric vehicles have been in operation in this country for the past nine years, they are still looked upon as an adjunct to the main track systems. Consideration of their performances, however, leads to the conclusion that a much brighter prospect is before them. The imposition of a weight restriction of 5 tons loaded has acted against improved design, and hitherto the vehicles have been constructed of materials too light to withstand heavy service, a circumstance which has led to frequent breakdown and consequent increases in working expenses. This weight restriction has now been amended to 5 tons unloaded, and this will lead to more satisfactory construction. An interim report of the Departmental Committee on Road Vehicles recommends a fixed annual charge for road adaptation and maintenance based on the seating capacity of the vehicle, and the present Finance Bill contains a clause giving this effect. In connection with the working expenses of the railless car in comparison with the track vehicle, Mr. R. H. Wilkinson, general manager of the Bradford Corporation Tramways, states that in the case of the system under his control the railless cars, although not of the most satisfactory construction, are approximately 4d. per mile cheaper in operation than the ordinary tramcar. This is chiefly due to their smaller weight and their running on more level roads. In arriving at the cost of working the Bradford railless vehicles, every possible charge was included, and all renewals were paid for out of revenue. It is found, however, that as the traffic density and mileage increase the difference between the working expenses of the two systems becomes less marked, and finally the railless car shows a greater charge than the tramcar. It is, therefore, of advantage to ascertain the point at which this takes place. The initial cost of a service will, however, be a most important factor in new undertakings. From figures prepared by Mr. Wilkinson, the cost of construction of one mile of tramway route is £29,000 single line, or £54,000 double line, as compared with £4,500 for a mile of overhead equipment necessary for the operation of railless cars. It is calculated that the point at which a tramway becomes more economical in operation than a railless system is reached, in the case of a single line at a five minutes' service, with an annual mileage of 160,000, and as regards a double track, at a three minutes' service, with an annual mileage of 266,000. In computing these figures due allowance has been made for the smaller earning capacity of the railless car on account of less seating accommodation.

The carrying capacities of the tramway and railless vehicles have been taken as 60 and 51 respectively—a difference of 15 per cent. less in the case of the latter type. This difference, however, would only hold good at busy times, when all cars were full, and this would occur for about 15 per cent. of the time the cars were in service. Thus with a fare of 1d. per mile the decreased earnings in the case of the railless vehicle would be, taking a daily mileage of 120, 15 per cent. of 120 miles at 9d., or 15s. 6d. per day, or 1.35d. per car-mile over the total mileage. The question of cost, although from the undertakers' point of view the most important, is, nevertheless, not the only consideration. Most important from the viewpoint of the passenger is the question of comfort in travelling. The reply in general is that the tramway, provided the track is in good condition, is the better in this respect.

Another consideration is safety, and in this respect it is thought that railless cars are liable to skid on snow, and not having a defined track, are more likely to collide with other traffic in foggy weather. On the other hand, railless vehicles have several advantages not possessed by the track vehicles. The breakdown of a car does not affect other parts of the service as in the case of a tramcar. Cars may be drawn up closer to the sidewalks for loading and unloading—this feature is important in congested thoroughfares. Railless vehicles make considerably less noise in operation, and offer greater facilities for inter-running. In addition to these points in their favour, railless vehicles may be employed beyond the limits of the trolley wires by the installation of batteries. This has been done for the past few months on the Leeds-Bradford parcels service at a running cost of 18.7d. per car-mile, or with the addition of interest and sinking fund charges, 22.5d., or 7s. 6d. per hour. Had two trips per day been run for a longer period the cost per mile would have been reduced. As an actual example of the parallel running of the two systems, the following statistics of the Bradford Tramways Department for the period April 1st, 1919, to March 2nd, 1920, are interesting:—

On the tramways the total running cost, including charges of all natures, for a mileage of 4,807,328, was £464,872, an average of 23.207d. per car-mile. The total revenue amounted to £518,558, or 25.888d. per car-mile, giving a profit per car mile of 2.680d. In the case of the railless vehicles the total mileage was 350,221, and inclusive running cost £26,432 —18.051d. per car-mile. The revenue was £17,010, or 11.656d. per car-mile, resulting in a loss of 6.395d. per car-mile. A considerable reduction in the power costs is noticeable in the case of the railless vehicles, the figure being 1.749d. per car-mile, as compared with 3.254d. for the tramcars.

WILSON-WOLF MOTORS.

Appreciating the strong and growing demand for very small electric motors, the Wilson-Wolf Engineering Co., Ltd., Bradford, has laid itself out to meet it with intensive organisation, adopting methods of manufacture which are believed to be unique. The machines have been completely redesigned, the works reorganised, and a policy of mass production of a limited range of sizes has been adopted. Naturally the most up-to-date methods of manufacture are employed, all operations are carried out under skilled supervision, with the help of special fixtures, tools, jigs, and gauges, and every part is manufactured to limits, subjected to inspection after each operation, and rejected if not found within the limits of tolerance required for interchangeable assembly. By means of these methods, and the use of the best materials obtainable, a high-class machine is produced for which guaranteed performance figures are given with regard to efficiency, temperature rise, sparkless running, silence and freedom from vibration; a variety of attachments has also been standardised, enabling the standard machines to be used with spindles vertical or horizontal, and to be adapted to fans, grinders and polishers, &c. For this reason, the stock motors are completed without feet or pulleys, these being added if necessary after manufacture; fan motors need no additions but are provided with three tapped radial holes for attaching them to the arms of the fans. The motors are of the protected type, with Hoffmann ball bearings, but enclosing covers can be fitted. The cylindrical frame with two poles is of cast-iron, the poles being shaped so as to eliminate humming; the armature is of the drum type with half-closed slots, wound, like the field coils, on special machines, and impregnated by the vacuum process. The brush-gear is of the firm's patented design, with few parts, and is of the box type using coppered carbon brushes.

The motor, fitted with power feet and pulley, and its parts are shown in the accompanying figures.

The motor illustrated develops ¼ H.P. at 2,100 R.P.M., or ½ H.P. at 4,200 R.P.M. on 110 or 220 volts D.C., series or shunt-wound, and is the first size ready for delivery; other ratings have been standardised, but none will exceed ½ H.P.

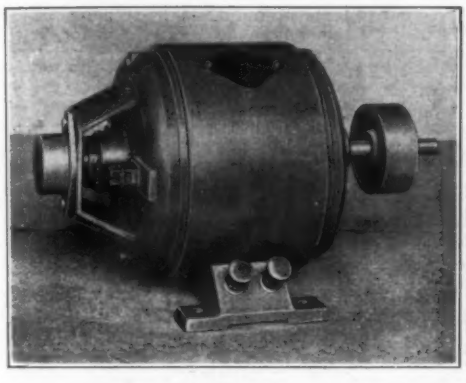


Fig. 1.—The Wilson-Wolf 1920 D.C. Motor.

Fig. 2.—Parts of the Motor.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

What is the Contractor Doing?

"Live Wire" condenses the question, but does not go far enough. The contractor as a whole is in a very difficult position. Two factors are working against him. In the first place the supply companies, whose unpaid and unblessed agent he is, are unfairly cutting the ground from under his feet, first by (until lately, at any rate) paying under non-union rates, and secondly, quoting for jobs much under cost price—a suicidal method, when they, at any rate, should know that the very contractors they sublet jobs to would carry out the work in an efficient manner for a minimum of profit and *still* secure them the market for current. In the second place the manufacturers are cutting their own "business" throats by not encouraging the contractor who, with a limited capital, has a showroom and window for the furtherance of trade. A small firm cannot possibly afford to purchase stock for show purposes and let it lie idle. A little forethought from manufacturers and factors would work wonders in disposing of their goods. The small contractor, who is out to get business, will do his best to push articles of approved commercial asset, but he, in most cases, cannot afford to sink a large proportion of his little capital in dead stock. We are open to show—and sell—anything of approved manufacture and adaptability, but the only firm (so far as we can discover) to meet us for mutual benefit is "*an American firm.*" And it pays them! Wake up, English manufacturers! and when you do, attend to the small details. They are the things that count. Finally, remove unfair competition from supply companies and put a little foresight into the management of English manufacturers, and there will be no need to ask "What is the contractor doing"? if you do, they will be too busy to answer.

Percy Walker.
Hurlingham Electric Co.

London, S.W., *July 26th*, 1920.

As one of the pioneers in the electric heating industry of this country, perhaps my remarks may be of interest.

In your issue of July 23rd, "Live Wire" asserts emphatically that the British manufacturer is much behind in the articles he puts on the market. Now, while this was true some years ago, to-day I think it is not true.

Many progessive concerns to-day making electric heating appliances have realised that well-designed and finished apparatus is essential if they are to prevent the Americans from commanding the British market. As an instance, take the electric iron.

There are perhaps half a dozen English makes which are fully the equal of any American iron. There is one make in particular which has a much higher class finish, embodies all the features which have been so prominent in the American product, and, in addition, has certain advantages over its rival. It is properly boxed and commercialised, and there is no reason at all for buying an American iron.

Again, in the circular cooker for use on the table, there is now an entirely British-made article fully equal in every respect to the American product. It is made on similar lines with eveleted mica supports in grid form, red-hot coils, standard plug connector, two pans which slide underneath the hot coils or rest on top as desired, the whole appliance being at least the equal in finish and appearance of the American product, and again it has the advantage of a replacable element.

British kettles are made to suit the English market demand, and are shaped for such a utensil. That this is correct is proved by the fact that the American manufacturer has gone to the trouble of making a model practically the same as the standard English model, to endeavour to capture our market.

Electric fires are too numerous to mention, and are everything that can be desired regarding design. The American is very much behind in this respect. The same may be said about toasters, and several other appliances, but what is lacking in the British financier and manufacturer is the recognition that the production of electric heating and cooking apparatus is no longer a side-line, but is an important industry.

Hitherto, and even up to the present moment, the generator, telephone, and other apparatus engineer, has looked upon electric heating as a "thing" hardly worth attention, yet it is the heater that uses a goodly portion of his product. To show that this attitude is a false one, one has only to visualise the huge concerns which have been gradually developing in the States until they have reached output figures quoted in millions of pounds sterling. After all, what we are all here for is to get hold of somebody else's money, and I venture to say that the manufacture of electric heating and cooking appliances will help in that direction just as much as any other branch of the electrical industry.

Like all modernisation, the potential user must have the apparatus forcibly brought to his notice. As a rule, he is not on the lookout for such things. He wants convincing that it is good for him to have them, and when you do this by proper methods, you create the demand. No article,

however perfect it may be, will command a satisfactory sale without suitable propaganda work. This aspect of industry in this country is unfortunately lacking to a deplorable degree, and this is where the U.S.A. man scores.

Liverpool. **Charles H. Archer.**
July 30th, 1920.

The Cost of Living in India.

"The toad beneath the harrow knows
Exactly where each tooth point goes;
The butterfly upon the road
Preaches contentment to that toad."

Thus does the great authority upon India, Kipling, enunciate one of his many epigrams, and I cannot help but think how applicable it is to the correspondence upon the "Cost of Living in India."

That a clear idea of the conditions of the country can be gathered from a "short" visit is totally erroneous, the more so it being during the cold season!

As one who has visited India since 1897 for periods varying up to six years in duration, I, too, would add a warning to those who are tempted to accept such positions. Will Mr. Dykes define "free quarters?" I have found the cost of furnishing even "furnished" quarters considerable, sufficient indeed to cripple me for many months.

Why is it that most young men become heavily involved in debt for the first few years in the country? Not always the glamour of the East and extravagance, but a hopelessness brought about in an attempt not to be "out-caste" amongst one's countrymen.

What type of "mechanic" would Mr. Dykes import for rupees 450 per month? Not the type of man that won us respect and prestige in India as the missionaries of "Western Science."

That the Indian will yet rise to the higher positions there is no doubt, once he learns to apply our "science," and I venture to say it would be better accomplished by precept than contempt.

The publishing of figures in rupees conveys nothing to the man at home, who when in India discovers that the rupee he is forced to spend purchases less than a shilling, and would be worth double as much if he could remit it home!

There are other considerations—illness, "privilege leave" to the hills, provision for "long leave" in England, unemployment, old age, &c.—too many to discuss in your valuable space, and all of which are responsible for the murmurs of distress which your correspondent has interpreted as the croak of discontented toads. **A. Toad.**

"The Plains."

"Tumbler" Switches.

It was interesting to read Mr. E. Fowler Clark's letter on the above subject. If my memory serves me over the past expanse of some 36 years, I remember meeting Mr. A. B. Blackburn in 1884 in the Edison station established under Holborn Viaduct. Mr. Blackburn, later, went to the Edison & Swan Co., and evolved, amongst other things concerning the reticulation of electrical energy, the "Tumbler" switch. Originally, and for a long time following, it was capped in cover with a reeded dome. Nowadays it is fitted with a "pill-box" cover in china or metal. The original pattern had a cylindrical coiled spring and solid jaws. Now one has the flexible spring copper contacts. Fuse terminals were added early, but are now generally discarded. To my certain knowledge, the "Tumbler" switch was devised by Mr. A. B. Blackburn, and has never been displaced in universal British practice.

It is a marvellous testimony to Mr. Blackburn's inventiveness that the pattern should have stood, with spring modifications, for nearly 40 years.

R. T. Turnbull.

Wellington, N.Z.
June 23rd, 1920.

Ten per cent. Discounts.

I should be interested to know the views of traders in connection with the amounts that are considered sufficient for an electrical contractor to trade with, as it is, of course, common knowledge to most people connected in the trade that engine and accumulator manufacturers, as well as certain others, consider that a 10 per cent. discount is ample to allow the retailer for profit on resale.

This would no doubt be perfectly true if the money of the retailer was obtained at the same speed that the wholesale man obtains his, as where the wholesale man is paid every month, the retailer will probably, in many cases, think himself very lucky if he receives it in six months.

With reference to the question of 10 per cent. being considered sufficient, I note from my balance sheet, which is based on a fairly large turnover, that during the period ending March, 1917, the trading costs amount to 15 per cent. on the turnover, in 1918 12 per cent., and in 1919 13 per cent.; it therefore naturally follows that if 10 per cent. is going to be the absolute limit for traders to work upon, something drastic should be brought into operation to compel the payment of accounts.

Under Government orders the oil suppliers demand cash on delivery, and the same applies to wine and spirit merchants, but as regards the ordinary retail trader he is left to get his money the best way he can, and if he asks for it in a peremptory way, he not only loses customers, but these customers will in nine cases out of ten do him all the injury they possibly can, and it is no use any firm considering it is so powerful as not to mind.

Another point that is overlooked entirely with regard to the discounts allowed is that the smallness of the discount does not allow for the expenses in connection with the order; I have in front of me at the present time a case which illustrates this very clearly with regard to the sale of an automatic electric lighting plant.

I find the actual out-of-pocket expenses entailed in the visits only paid to a certain customer, reached the amount of £11 10s., and that the profit on this article will be £22, so that if one takes into account the office working expenses in addition it naturally follows that it would have been better never to have had the order at all, as it is doubtful what benefit one gets except it may be at some future time I shall get the repair work, which is a very doubtful honour.

I quite understand it is almost hopeless to fight any questions like this, as the percentage of firms that belong to the Employers' Association is so small as not to be worth considering, and so long as it is possible by aid of the wholesale houses for any man to start in business in the electrical line, whose sole capital consists of unlimited hope and a pair of pliers, it is hardly likely any remedy can be found to put matters on a fairer business footing.

One firm, when I made a suggestion that the 10 per cent. was too small for trade discount, told me they had large expenses to meet in advertising, and they, therefore, considered it was not possible to allow any more, informing me that the contractor could obtain his real profit out of the wiring, which is, incidentally, that part of the work that takes the most looking after for the least return.

I have also had several cases where a customer induced me to carry out the wiring, and afterwards purchased the whole of the plant through his business house, and, I suppose, as he would buy it for his business house, through the operation of E.P.D., it would cost him nothing.

I shall be interested to have the views of any other contractors in connection with this matter.

Electrical Contractor.

July 27th, 1920.

Squashed Again!

In the article on "The Manufacture of Water Turbines in England," which appeared in your issue of 23rd inst., it is stated that the turbines will be manufactured in Glasgow.

In order to correct a misapprehension which appears to exist in the South, I wish to state that Glasgow is not in the North of England, but is situated in that wild and mountainous tract of land, to the North of England, which is called "Scotland" on the map, but which is frequently referred to by war profiteers as "my grouse moor" or "my deer forest, N.B."

It may appear incredible that the wild red-haired and kilted savages of these remote parts may be taught the mechanical arts, but the Englishman's skill in this direction is proverbial.

John W. Black.

Glasgow, *July 29th*, 1920.

[We plead guilty, and sue for mercy. Evidently there is still a Scotsman in Glasgow.—Eds. Elec. Rev.]

LEGAL.

Marconi's Wireless Telegraph Co., Ltd., v. Hamilton.

This case came before Mr. Justice P. O. Lawrence in the Chancery Division on July 28th, when the defendant applied for an adjournment. He said he had instructed solicitors and counsel, but on the previous afternoon he was informed by his leading counsel that he had been called away and was unable to appear for him. He wished to have an adjournment in order to have the advantage of his counsel's presence.

Mr. Hamilton said Sir John Simon, K.C., had promised to take his brief, but he had been called away.

Mr. Hogg said he communicated with junior counsel for Mr. Hamilton the previous day asking him whether the case should be adjourned on the ground that his leading counsel could not be present. He then learned that Sir John Simon had returned his brief. He added that since the defendant gave his undertaking he had written a long letter to the solicitors instructing him (the speaker), in which he asked them to communicate to every director of the company a letter, which in every respect broke the terms which he made in the undertaking. The company were not moving against him, but he would ask his Lordship to point out to him that he should refrain from writing to anybody connected with the case in that way.

His Lordship informed Mr. Hamilton that he must not write or say anything at all to anybody, and he then adjourned the case over the Long Vacation.

BUSINESS NOTES.

Bankruptcy Proceedings.—C. J. T. Hayman, electrical engineer, 76, Malvern Road, Leytonstone, lately carrying on business at 96, Woodhouse Road, Leytonstone, and 1, Goodmayes Road, Goodmayes.—At a sitting of the London Bankruptcy Court, held on July 23rd, before Mr. Registrar Francke, this public examination was held. The debtor filed his own petition on June 2nd, and has lodged accounts showing liabilities £221, against assets "a bad book debt £85." Questioned by Mr. Daniel Williams, Official Receiver, the debtor stated that he commenced business in January, 1919, without capital, at 96, Woodhouse Road, Leytonstone. The business was successful, and with a view to extending it, Hayman Wood & Co., Ltd., was formed with a capital of £4,000 in £1 shares, of which 827 were subscribed for in cash. In December last the company took over the business and book debts in return for £1,600 in shares, 600 of which were allotted to a cash creditor, and they also undertook to pay the other liabilities of the business, amounting to between £200 and £300. Witness was appointed managing director of the company at a salary of £500 a year. They agreed to purchase the lease of engineering works at Goodmayes, together with the plant, &c., for £5,500, payable by instalments, only one of which (£750) was paid. The business was continued at both premises until the end of last January, when the effects at 96, Woodhouse Road, were removed to Goodmayes, where the business was carried on until the end of March, when, through want of capital, it was closed, and the vendors took possession of the premises. Witness attributed his insolvency to the failure of the company to discharge his trade liabilities in accordance with its undertaking to do so. The examination was concluded.

Bernard Esmond Thomas, 12, Castle Meadow, Norwich, electrical engineer. The following are creditors :—

Cottram, A. L.	£21	Morris, Wm., & Sons	£83
Attoe, George	42	Boyce, H.	157
Bordesley Electrical Co.	11	Dickerson, G. B.	151
B. E. Co.	55	Eccles, F.	100
Callender's Cable Co.	46	Flux, W. F.	52
Dennes & Co., Ltd.	13	Garrod, R. E.	201
Duge, H. E., & Co.	21	Hammond, W. H.	53
General Electric Co.	153	Lancaster, W. S.	106
Hand & Co., R. B.	22	Harris, H. T.	153
Norwich Corporation	89	Wellingham, T. A.	159
Tyce, George	16	Wray, H. E.	151
Times Electrical Co.	14	Sunderwall, W. H.	114
Stella Lamp Co.	50	Dodson, John	15

Walter Henry Mellon, late trading as H. B. Wallis & Co., electrical engineer, 37, Elliott Road, Chiswick, Middlesex, late 43, Turnham Green Terrace, Chiswick, Middlesex. The following are creditors :—

Fishman, S. Z.	£14	Siemens Bros. Dynamo Works, Ltd.	£42
General Electric Co., Ltd.	53	Wood, Milne, Ltd.	23
Metropolitan-Vickers Electrical Co., Ltd.	41	Bell, Thos., & Co.	33
North British Rubber Co.	15	Nonchi, H. K.	97
		Robertson, A. V.	100

A. R. Meggett, electrical engineer, 45, Thrumpton Lane, East Retford, Notts.—First meeting, August 9th: public examination, September 16th; both at Lincoln.

Birmingham Health Exhibition.—The name of the Rawlplug Co., Ltd., should have been included among the list given last week of exhibitors who received the Bronze Medal.

Company Liquidation.—Haslam & Stretton (Bristol), Ltd.—Meeting to receive liquidator's report of the winding-up, August 30th, at 11, Windsor Place, Cardiff. All claims satisfied in full. This notice in no way affects the parent company of Haslam and Stretton, Ltd.

Trade Announcements.—Owing to the growth of their business in the Midlands district, Messrs. Simplex Conduits, Ltd., have opened a sales office at 41, Church Street, Birmingham. It is in charge of Messrs. Underwood & Westwood, who have been representing the company in this area for many years.

Messrs. Vickers, Ltd., Broadway, London, S.W. 1, have opened a depôt for Wales and the South West of England at 43, Park Street, Bristol.

Catalogues and Lists.—The Wilson-Wolf Engineering Co., Ltd., Thornton Road, Bradford.—Leaflets giving particulars of fractional horse-power motors.

The British Electric Transformer Co., Ltd., 50, Oxford Street, W. 1.—Illustrated catalogue No. 36 S, together with price list, printed in Spanish, and dealing with "Tricity" heating and cooking apparatus and "Flamingo" fires. A French edition will shortly be available.

Messrs. M. E. Du Bois & Co., 1, Guildhall Chambers, Basinghall Street, E.C.—Illustrated catalogue No. 2, and price list, dealing with "Calora" electrically-heated pillows, rugs, bandages, clothing, &c.

Messrs. F. & A. Parkinson, Ltd., Guiseley, Leeds.—Illustrated catalogue No. 4, which, in addition to giving prices, states the number of weeks in which delivery can be made according to the type of motor selected.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, Manchester.—Illustrated priced catalogue (S.L.I., Section XC), dealing with "Exide" batteries for starting, ignition, and lighting purposes; a reduction on the prices quoted in the previous list is noted.

The J. L. Electric Co., 30, Church Street, Birmingham.—Priced leaflet of the "Universal" clip for fixing C.T.S. lead-covered and armour-sheathed cables.

Messrs. Isaacson & Brown, Ltd., 39, Furnival Street, Holborn, E.C.4.—Illustrated priced leaflet of the "Bettalite" half-watt bowl fittings.

Messrs. Fraser & Chalmers Engineering Works, Erith, Kent.—Illustrated publication No. 2,324, dealing with the No. 6 table concentrator, which is claimed to possess a number of advantages, including the ability to effect a practical separation between two or more classes of mineral of differing specific gravities.

Private Meeting.—Lester & Brown, electrical engineers, Surbiton Road, Kingston, Surrey.—A meeting of the creditors of the above was held on July 30th, at the offices of Messrs. Woodham, Smith & Borradaile, solicitors, 5, Chancery Lane, W.C. It appeared that the business was carried on by Mr. Lester, who commenced to trade at Surbiton Road about the beginning of the present year. The liabilities to the creditors were in the neighbourhood of £1,100. A few months ago the business was transferred to a limited company, which took over the assets and issued shares to the vendor. The assets acquired by the company were understood to consist of goodwill, fittings, &c., valued at about £600; furniture, &c., £500; stock, £150, together with the lease. A branch was opened at Nottingham, but that resulted in a considerable loss. The company was formed with a view to getting further capital. The creditors were first called together some weeks ago, when Mr. Lester offered to deposit shares in the company as security for the payment of the claims. Mr. Borradaile said that Mr. Lester could not attend the meeting owing to ill-health, and the best offer that could be made was a composition of 6s. 8d. in the £. That was the most that could be done. Mr. P. Houston (Messrs. Corfield & Cripwell) said that when the creditors were first called together they definitely refused 5s. in the £, and stated that they would not accept a less composition than 10s. in the £. There had been several adjournments, and the only increase was 1s. 8d. in the £. Very little had been achieved by the adjournment. He added that he could not recommend his clients to accept 6s. 8d. in the £, and he understood that none of the creditors would take less than 10s. in the £. He pointed out that the debtor had transferred his assets to a company, and subsequently had offered his creditors shares in that company as security for their claims. The solicitor said that if the offer was not accepted the creditors would have to pursue their own remedies, and Mr. Houston replied that other action would be taken. The meeting broke up without any resolution being passed, but two or three creditors stated that proceedings in bankruptcy would be commenced. The principal creditors are :—

Pope's Electric Lamps	£53	International Electric Co.	£60
Oriental Tube Co.	60	Siemens Bros. Dynamo Wks.	73
Johnson & Phillips	457	Shenton, F. J.	120
Stella Lamp Co., Ltd.	370	Treloar & Co.	50

Annual Outings.—On July 24th the employés of Messrs. Ridout & Radcliff, Ltd., went for their annual holiday in the country. The party went by rail to Chesham, and thence by brakes to Cholesbury, near Tring. Lunch and tea were provided at the Half Moon Hotel. Mr. N. Jones, representing the firm, occupied the chair at the luncheon. Mr. C. Evans proposed the toast, "Prosperity to the Firm," and Mr. Jones suitably responded. Bowls and quoits and a cricket match arranged with the local club occupied the afternoon.

The Union Cable Co. held their annual outing on Saturday, July 24th, when a large number of the employés, both works and staff, spent the day at Southend-on-Sea, whither they travelled by charabancs. At the Maisonette Café they were received by Mr. J. Snow Huddleston (general manager) and Mrs. Huddleston, Mr. F. W. Johns (secretary), Mr. Howitt Smith (works manager) and Mrs. Smith, and Mr. T. Johnstone (works foreman). During the luncheon selections were rendered by the band of the Union Cable Co.'s employés. Mr. Huddleston expressed his pleasure at the presence of so many of the company's employés, and hoped that it would be possible on the next occasion to arrange for the presence of everyone in the company's employ. On behalf of the management, he appreciated the manner in which the output of the works had grown, and he felt sure that, with the promise of increased supplies of raw materials, even the present records would be surpassed. On behalf of the works, Mr. Howitt Smith responded, and in thanking the management for their generosity in giving such an outing, assured them that it was the wish of everyone present to see the Union Cable Co. make great progress.

Annual Holidays.—The works and offices of Messrs. Allen West & Co., Ltd., Brighton, are closed until Monday morning, August 9th, for the summer holidays. Urgent correspondence is being dealt with.

The works of Messrs. Cleworth, Wheal & Co., Castleton, Lancashire, will be closed from Friday, August 13th, until the morning of Monday, August 30th, for the annual holidays. A staff will be in attendance for urgent business.

Norwegian Cable Contracts.—It is stated that the Norwegian A.S. Skandinaviske Kabel og Gummifabrikker has just received two large orders for the supply of cable to the Telegraph Administration, and the Christiania Electricity Works. The two contracts, which comprise 930 miles of single cable, have been allotted in competition with a number of foreign rivals, the Norwegian offers being from 10 to 20 per cent. lower than the prices quoted by the latter. In addition, the company is reported to have obtained orders for 217 miles of cable for Holland and the Dutch Indies, and a number of small orders from England.

Book Notices.—"*Journal* of the Institution of Electrical Engineers." Vol. LVIII, No. 292. June, 1920. London: E. & F. N. Spon, Ltd. Price 10s. 6d.—This issue contains the following papers:—"Notes on Operating a By-Product Producer Gas Plant," by Mr. W. H. Patchell; "Production of Power from Blast Furnace Gas," by Mr. S. H. Fowles; "The Electrical Equipment of Artisan Buildings," by Mr. L. Milne; "Alternating-Current Track Circuiting," by Mr. L. H. Peter; "The Effect of Shunted Resistance or Plug Leakage, on the Sparking Performance of an Electrical Ignition System," by Mr. G. E. Bairsto; also the Report of the Earthing Sub-Committee of the Wiring Rules Committee, and the Chairman's (Mr. F. S. Grogan) Address to the East Midland Sub-Centre.

A novel pocket-book for engineers, entitled "The Engineering Inquiry," compiled by Mr. Tomey Thompson, will be published on August 10th, price 7s. 6d., by Messrs. J. W. Arrowsmith, Ltd., of Quay Street, Bristol. The volume specifies the complete information which engineering manufacturers and sellers need in inquiries from prospective buyers, and covers the bulk of mechanical and electrical products and accessories.

"Science Abstracts (A and B)," Vol. XXIII, part 6, No. 270. June 30th, 1920. London: E. & F. N. Spon, Ltd. Price 2s. 6d. each, post free.

The July, 1920, "Chloride Chronicle," No. 11, contains a number of interesting notes and comments in addition to the illustrated articles.

"Abstracts of Papers in Scientific Transactions and Periodicals." New Series, No. 4. July, 1920. London: The Institution of Civil Engineers.

Industrial Councils.—The District Industrial Council, No. 5 (West Midlands Area) has issued a schedule showing the duties to be performed by and the inclusive rates approved by the Council to be paid to the employés of the several electricity supply undertakings in the District as from June 14th, 1920. The undertakings have been classified into three zones, of which Zone A includes Birmingham, Coventry, and the Shropshire, Worcestershire, and Staffs. Electric Power Co. (Smethwick); Zone B covers the Midland Electric Corporation for Power Distribution, Ltd., Redditch, Rugby, Stoke-on-Trent, Shropshire, &c., Power Co. (Dudley), Stafford, Walsall, Wolverhampton, Worcester, and West Bromwich; and Zone C includes the remaining undertakings in the area.

For an electrical fitter and electrician, Grade 1, or a fitter-driver, the total minimum rates per hour, including all bonuses, are 2s. 1d., 2s. 1d., and 2s. repectively; Grade 2, 1s. 10½d., 1s. 10½d., and 1s. 9½d. For an electrician's mate (over 22) the rates are 1s. 7½d., 1s. 7½d., and 1s. 6½d. For an engine driver, Grade 1, or switchboard attendant, Grade 2, the rates are 1s. 10d., 1s. 9½d., and 1s. 9d., plus extras (*a*), 1d. as consideration for men working night work on rotating shifts where no specific rate for night work already exists, and (*b*) 1d. as consideration for men working Sundays on rotating shifts where no equivalent rate for Sunday work already exists, the extras applying to all hours worked by such men.

Regular night shifts and Sundays, it will be observed, do not rank as overtime, special provision being made to meet these cases. The schedule, which deals with 58 classes of employé, is dated July 21st, 1920.

Australian Tramways and the Duty on Rails.—An Australian newspaper says that should the proposed duty of 35 per cent. be imposed on steel rails, the extension of tramways in distant suburbs may be delayed. The Tramway Board has under consideration many schemes for extensions, and has represented to the Commonwealth Government that the present duty of 17½ per cent. on grooved rails should not be increased until these rails are manufactured in Australia. The Board has intimated that it is anxious to co-operate in the encouragement of industries in Australia, but does not consider that a public utility should be hampered in its operations because it is desired to increase duties for revenue purposes.

The Liverpool Dispute.—The strike of cable-jointers at Liverpool, Bootle, Birkenhead, and Wallasey was the subject of comment at the monthly meeting of the Wallasey Town Council, when the chairman of the Electricity Committee said that their men had gone out on strike claiming a higher rate of pay than that conceded by the Whitley Council, with all back pay and conditions of employment as from September 4th, 1919. The Electrical Trades Union had put forward a claim for increases for cable-jointers, on the ground that another class of men employed by installation or wiring contractors had obtained an increase. The fact that the Trade Union representatives on the Whitley Council had not demanded a meeting to consider the matter, indicated that the E.T.U. could not obtain the support of the other Unions for what was considered an unjust demand. While sympathising with the ratepayers who were being inconvenienced waiting for installations, the Committee felt it was not justified in breaking an agreement entered into with the full consent of all the Unions until it had been considered by the Whitley Council, which was set up for the express purpose of adjusting legitimate claims.

Patents and the Treaty of Peace.—In the *London Gazette* of July 30th, the Board of Trade publishes the "Patents (Treaty of Peace) Rules, 1920," which were to come into operation on July 19th, 1920. The Rules relate to assignments and licences in connection with restored patents, as well as revisions of licences, the expropriation or sale of restored patents, &c. Schedules of fees and forms for applications are given.

Winnipeg.—We have received from the Winnipeg Board of Trade a fat little book entitled "Facts About Winnipeg," wherein a good deal of information is given respecting the public authorities of the city, its schools, public parks, hospitals, the hydro-electric system and its finances, the new water supply, street railways, &c.

"Welco" Prizes.—Messrs. Welco Patents, Ltd., of 150, Alma Street, Birmingham, are offering a series of prizes for photographs which may be sent to them showing electrical switchgear and apparatus mounted on their "Welco" patent fixing frames. For every such photograph sent in, whether they use it or not, they will award 2s. 6d.; they will pay one guinea every week for the photograph selected for use in their advertisement appearing in the Electrical Review; and, further, an additional £5 per month will be awarded for the best photograph published in such advertisements in our pages during the month.

Position of the German Electrical Engineering Industry.—According to a Reuter Trade Service dispatch from Berlin, dated July 24th, an address on the present position of the German electrical engineering industry was given by Herr Henrich, manager of the Siemens-Schuckert works, to the members of the Workers' Association of the German Electrical Engineering Industry, at their meeting in the Siemens building.

Herr Henrich said: "In 1913 the German electrical industry occupied a prominent position both within our own borders and in the world, and it was responsible for 40 per cent. of the world's production. To-day the world position of the industry is deeply shaken, on account of the foreign, and particularly the American, competition which has sprung up in the interval, and all the more so as our inland production prices, in the present state of the exchange, are already above the market prices of the world, with the result that we are no longer capable of competing in foreign countries. Instead of the economic catastrophe which was feared in the autumn of 1918, there came, with a falling exchange and a growing inflation of prices, a disquieting rise, and the disenchantment followed overnight. Unemployment increased, orders fell off by 50 per cent. or more, and many electrical engineering works found themselves with no business at all. The market is dead. Such is the general position. Amongst the various branches of the industry the position is worst in the cable business, while the installation and small motor industry is in much the same state. In the incandescent lamp industry, provision has been made for an output of about 70,000,000 lamps. The export trade, taking before the war over 50 per cent. of the total production, has fallen to below 25 per cent., and there is now lively competition abroad. To-day there is no electrical engineering firm that is not in the gravest financial difficulties. Many firms have already had to think of curtailing their activities. Since the beginning of the war, the production of the electrical engineering industry had declined heavily; during the war, because the factories were busy with war contracts which were mostly outside the ordinary scope of the electrical industry, and since the revolution because of the numerous strikes and the general unwillingness to work. According to a statistical return, there were 80 separate strikes in the Berlin metal industry during 1919, covering altogether 162 days. In one of the Siemens works—an example which is typical of the electrical engineering industry—only 63 per cent. of the available working hours were worked. The works tallies show for the current business year a production of 2,250 kilograms per head, as against 4,400 kilograms before the war. On the other hand, the wages paid per kilogram of finished goods rose from 43 pfennigs to 2 marks in 1919, and are now reckoned at over 4 marks. Sharply-rising prices led to the dissatisfaction of the workers, because their wages and salaries did not rise in the same proportion. The sales prices, however, are governed by the cost of the materials, while cost of the necessary rubber, shellac, copper, &c., are absolutely dependent on the exchange." Herr Henrich concluded by saying that the rebuilding of the industry would never be successful unless the workers came to an understanding of the realities of the economic position.

Engineering Wages.—The decision of the Industrial Court respecting the 6d. per hour demand is occasioning growing discontent in various parts of the country. There is a desire to discontinue the Industrial Court method of dealing with such matters, and to return to the pre-war practice of settling wages by direct negotiations. The Labour correspondent of the *Manchester Guardian* writing on the subject, says:—

"It seems probable that the employers will be no more willing than the Industrial Court to grant a further advance, and there are, therefore, serious prospects of big disputes extending throughout the industries concerned. This, however, is not likely to occur for some time, as direct negotiations will have to be undertaken with the employers, and the Unions may even regard themselves as bound to give four months' notice of termination of the present agreement before taking action. Such notice could in that case date from the day of the recent award and disputes could not occur until autumn.

"Unrest is, however, so serious and general throughout all sections of the workers concerned that it may be impossible to delay action so long. The continual failure of the engineering employers to come to terms with the Unions on any of the big questions of post-war conditions materially aggravates the present unrest and may lead to hasty action with or without the endorsement of Union executives."

According to another Press report, Mr. Tom Mann, of the Amalgamated Engineering Union, advises preparing for a severe struggle with the employers and the Government, without delay.

Developments at Kobe.—A Tokio dispatch through Reuter's Trade Service states that a great scheme is under way for the improvement of Kobe. The rough estimate for the work is between 300,000,000 yen and 400,000,000 yen, with every possibility of a further increase as the work proceeds. More tram lines will be laid all over the city, and part of the hills behind the city will be converted into residential quarters, mostly for the working classes, and a tramway system is to be laid across the hills to facilitate communication between these quarters and the city proper. The present Government railway is to be greatly improved, whether the system should be underground or overhead being still under discussion. The suburbs of the city will undergo great changes. Various private suburban electric companies are doing their utmost to secure official permission to bring their respective lines further into the city. Special quarters east of the river will be allotted to factories.

Sweden.—The Aktiebolaget Zander och Ingestroem, of Stockholm (electrical engineers, &c.), is to increase its share capital from 1,000,000 kr. to 1,250,000 kr. by the transference of accumulated profits.—*Reuter's Trade Service.*

Dominions Touring Exhibition.—The Department of Overseas Trade has issued a pamphlet in connection with this exhibition, which is being organised with a view to pushing British manufactures in the principal cities of South Africa, New Zealand, Australia and Canada. The exhibition, which will consist of half-unit, or unit, shows at £126 per half-unit, or £210 per unit, will leave England early in 1921, and will travel for two years. We have already placed the scheme and its merits before our readers, and have commended it to the sympathetic and enterprising attention of British manufacturers, so that all that now remains for us to do is to advise traders to apply to the Department (35, Old Queen Street, S.W. 1), for copies of this pamphlet, wherein are set out a good many particulars, accompanied by illustrations of the proposed show-cases. A demonstration kinema lorry will accompany the exhibition for the display of trade films in the places visited.

Inquiries.—Makers of 2-ton pulley blocks marked "Record," and British agents for the "Royal" vacuum cleaner, are asked for. Makers of an all-British electric clothes-washing machine are asked for.

Report on Brazil.—Brazil has wonderful and unlimited resources, and that fact often elicits the question: "Why is it, with all these resources, she has not made more progress in her export trade and internal development?" In a report by Mr. E. Hambloch, Commercial Secretary to H.M. Embassy, Rio de Janeiro, the causes which impede production are summed up thus: "Lack of adequate transport facilities (the enormous territory occupied by Brazil must always be remembered); absence of a developed system of credits, especially in agricultural districts; deficiency of technical education; onerous municipal and State imposts; and, in the northern districts, severe droughts." Mr. Hambloch's report deals generally with the economic and financial conditions of Brazil for the year 1919, and we commend it to the study of those of our readers who are specially interested in the future of the great foreign markets where British traders have an opportunity for doing a greatly-increased business. It is obtainable at H.M. Stationery Office (Cmd. 840—6d. net). It reviews the natural resources and the difficulties of development, deals briefly with legislative matters, transport facilities, and covers such trading points as imports and exports, internal trade, foreign trade, methods of trading, public utility companies, &c. In discussing methods of trading, the importance of carrying stocks of goods is referred to as follows:—

"It is high time that British manufacturers should convince themselves of the imperative necessity of having stocks of machinery on the spot. In the past they appear to have refused almost entirely to admit this point of view. The average customer in this country will always buy on the spot, even if the machinery offered is not exactly what he requires, in preference to waiting for some months until his order can be executed. It is, therefore, essential that standard types of machinery should be stocked. British houses here have lost no inconsiderable business in the past through not having goods in stock. Gas engines, for instance, are stocked by local Swiss houses for account of the Swiss manufacturers. These remarks apply to cities like Rio Janeiro and Sao Paulo, and it can, therefore, be imagined that they apply even more in such towns as Curityba, Porto Alegre, &c., where the farmers go into the towns at fixed intervals, and want to be able to buy at once such stocks of machinery, agricultural implements, &c., as they require in exchange very often for their produce. German stocks of electrical and agricultural machinery in this country enabled them to do a big business for a very long time after the outbreak of war in spite of the fact that they received no direct supplies from Germany."

Earlier in the report Mr. Hambloch reviews Germany's trading position and activities in the country. He says, in the course of his remarks:—

"British goods have always enjoyed such a splendid—and, be it said, well-deserved—reputation for high quality in Brazil that they may almost be said to have sold themselves. But the specious advantages of cheapness and long credits offered by our German competitors had begun, at the outbreak of war, to create a position for our own trade that might eventually have become serious. In a new country where accumulated capital and wealth hardly exist, the lure of cheapness and long credit must tell, and there are many cases where the Brazilian importer, who would have preferred to purchase a British article which he recognised as far superior and worth more money, was obliged to buy from Germany on account of the immediate advantages which he could obtain by so doing. There is, moreover, no phase of national industrial expansion in which the Germans did not interest themselves. They thus found themselves allied with the powerful industrialist class, alluded to elsewhere, and to important political people. British enterprise has also (perhaps more recently) interested itself in this branch of local internal trade (though it is almost impossible to make any accurate estimate) to a much lesser extent. Certainly, as in so many other things, the Germans appear to be pursuing a deliberate policy in this direction. There is one other point—an important one—which must be mentioned in connection with German trade with Brazil, and that is the extraordinary knack which the German trader possessed of captivating, if not capturing Brazilian clients who visited Germany. There is ample testimony to this on all hands. There is no desire to imply that Brazilian traders visiting England were not well treated—they undoubtedly were; but the fact remains that the Brazilian visiting Germany was made to feel that he was singled out for attention. Quite apart from business, the smallest details for his personal comfort and well-being were thought out and arranged. It may appear a small point, but though the German is undoubtedly a bad psychologist in forming general estimates, he studied the psychology of his individual clients with care and with success."

It appears that the introduction of the Statutory List during the war was received with much derision by Germans and their friends in Brazil. "But as time progressed, those 'who came to scoff' remained to admit its efficacy and to set about trying to evade its effects. The usual array of clocks and straw-men appeared and were dealt with as discovered. The real value of the list began to be felt from the moment that it was generally realised that it did not pay to have dealings with listed firms. But though the list did all that could reasonably have been expected of it, it was unable to uproot in a few years the German hold on commerce here which had been the work of many years. New channels of trade were, indeed, created, and it is to be hoped that many of them will remain permanently; but if Germany herself is in a position to take advantage of the situation (and there seems much doubt on this point), she will find awaiting her in Brazil the old avenues of trade, a little ragged at the edges, and a little rougher than of old, but still existing."

Municipal Corporations and Prices of Constructional Materials.—A number of the Metropolitan borough councils have been considering the increased prices of constructional materials where such prices are controlled by associations of manufacturers. It is complained that it is becoming more common on the issue of invitations to tender, to receive a series of quotations of identical amounts, merely a printed schedule frequently being submitted. The Westminster Council holds that the effect of the system is to stifle competition and the consumer is forced to pay arbitrarily fixed prices. It has communicated with the Board of Trade on the matter, asking it to take measures to stop the practice of price control by combinations of manufacturers. The Hammersmith and St. Marylebone Councils are among the authorities which have been recommended by their committees to support the action of Westminster. The action has resulted from the issue of advance notices respecting prices of stoneware pipes and cement by the Midland Pipe Association and the Cement Marketing Co., Ltd.

The German in Belgium—Again.—A German correspondent at Antwerp, writing to a Frankfort newspaper on the interchange of trade between Belgium and Germany, states that a large quantity of goods from the latter country reaches Belgium by way of neutral countries, and frequently under a "neutral flag." Even German machine tools, aluminium, cutlery, &c., are said to be shipped from England. A number of German merchant importers living in Belgium before the war, have been permitted by the Belgian Government to return, although it is known that they will devote themselves chiefly to the import of German goods. On the other hand, Belgian importers will only purchase German articles where the origin is not visible, "as the feeling among the Belgian population towards German products must be considered as continuing hostile." Yet it is declared there is a market for Teutonic machinery of all kinds, metal boxes, electrical articles, &c.

Australian Electrolytic Zinc Industry.—The Melbourne *Age* announced in June the official statement of the board of Electrolytic Zinc, Ltd., that it was expected that within a few weeks the output of electrolytic zinc would be increased from 100 tons to 140 tons per week by the use in portion of the large new plant of an extra 1,750 H.P. of electrical energy to be supplied to the Risdon works, Hobart, under arrangement with the Tasmanian Government. The construction of the first half of the new 100-ton zinc plant was being steadily advanced, and work on the buildings and plant for the treatment of by-products and the development of subsidiary industries was also proceeding.

Reuter's Trade Service agent at Hobart reported, on July 30th, that the Electrolytic Zinc Co. of Australia had absorbed the Mount Read Co., Ltd., in consideration of 350,000 ordinary fully-paid £1 shares of the Electrolytic Co. and the option to take up a further 150,000 cumulative participating preference shares of £1 each at par. The former company proposes to increase its authorised capital to £2,500,000. The ore reserves of the Mount Read Co. are estimated to exceed 1,000,000 tons, and the capacity of the Electrolytic Co.'s plant is to be increased from 15 tons to 100 tons daily. As a result of the amalgamation the Electrolytic Co. will be largely independent of the Broken Hill Mines for concentrates. The Electrolytic Co. has also taken over the option to purchase the Zeehan Smelting Works from the Government.

Wages of Railway Electrical Workers.—The claim of the National Union of Railwaymen for an increase of 4d. an hour on the pre-war rate, plus the recent 6s. advance, the 33s. 6d. a week, and the 12½ per cent. war wage, for men employed in the electrical power and sub-stations belonging to the controlled railways of Great Britain, has not been approved by the Industrial Court.

The Court accepts the contention of the companies that the existing rates and conditions of service instituted for the London district be confirmed, and that the rates obtaining in London should be extended to similar grades of workers in the country, less 10 per cent., except in the cases of Glasgow, Liverpool, and Manchester, where the rates would be 5 per cent. less than in London.

For the stations which supply railway workshops with lighting power, the Court decided that the conditions of service shall be the same as those obtaining in the workshops of which the power stations virtually form a part. The decision is to have effect on and after December 1st next.—*The Times.*

Electric Conduits for Cuba.—A Cuba company is desirous of promptly receiving from British manufacturers quotations for black enamelled ridged conduits in 10-ft. lengths, diameters from ½ in. rising by ¼ in. to 1¼ in. and then by ½ in. to 4 in. The quotations should be based on delivery c.i.f. Havana. Quotations are desired for four car load lots of ½-in. conduits, and two car load lots of each of the other sizes. The company is stated to be an important concern predisposed towards British goods. This would appear to present a very favourable opportunity for the introduction of British-made fittings. Manufacturers may obtain the name and address of the inquirer from the D.O.T. in London.

For Sale.—West Hartlepool Corporation Electricity Department invites offers for one Hall's compound vertical feed pump, one Nichol's single-cylinder ditto., one water softener, various valves, steam pipes, and one Green's economiser. See our advertisement pages to-day.

Cable Workers. — Wages. — Six Unions are taking a ballot of cable workers on the question of enforcing the claim for an advance in wages of 15s. a week for all workers aged 18 and over, and 7s. 6d. under 18, with a guarantee for pieceworkers. The Cablemakers' Association, following meetings of the Industrial Council, made what is described as a final offer of a further war advance of 5s. per week to male workers of 18 and over, and an increase of the minimum for women of 18 and over from 41s. to 43s. The ballot papers state that the offer, in the opinion of the affiliated societies, is "wholly unsatisfactory."—*The Times.*

LIGHTING AND POWER NOTES.

Aldershot.—Loan Sanctioned.—The Urban District Council has received sanction to a loan of £7,000 for new feeders.

Birkenhead.—Loan Sanctioned.—The Town Council has received sanction to a loan of £20,000 for mains and services, and £12,500 for meters.

Bolton.—Extensions.—The borough electrical engineer has reported on a suggestion by the Electricity Commission that Back-o'-th'-Bank generating station should be laid out for a plant capacity of 46,000 kw. Extensions would be required to buildings and to generating, boiler house, and condensing plant. The Electricity Commission approved his scheme and requested the Finance Committee to apply for sanction to borrow £497,000 for extensions, in addition to £374,379 for extensions to plant and buildings now in hand.

Coventry.—Plant Insurance. — The manager has reported upon the present value of the boilers and economisers at the generating station, and suggests that the insurance should be considerably increased. It was decided that the total insured value of the plant be increased from £89,000 to £141,500, and that in addition a further cover, to the extent of £10,000, be obtained by means of a floating policy. With regard to extensions, tenders have been invited for the erection of offices at the Sandy Lane station.

Haslingden.—Bulk Supply.—The agreement for a bulk supply from Accrington is to be renewed upon revised terms under which the cost is considerably increased.

Japan.—The Fuji Water Power Co. has decided to amalgamate the Shiratakigawa Water Co., the Soko Water Power Co., and the Tsukui Electric Co., which own their plant and wires within the Fuji zone of supply. When this amalgamation is accomplished, the company will enlarge its business possibilities by erecting a big transformer station at Kozu.—*Reuter's Trade Service.*

Liverpool.—Expenditure.—The Secretary of the Electricity Commission has forwarded to the Corporation sanction to borrow £145,000 for purposes of the electricity undertaking. Of this sum, £100,000 is for plant and foundations, and £45,000 for cooling towers and foundations at the Lister Drive power station. Further large expenditure on the city's electrical undertaking are contemplated, and on the recommendation of the Tramways and Electric Power and Lighting Committee, it has been decided that application be made for sanction to extension of the generating plant at Lister Drive power station, and borrowing powers to the extent of £115,000 for additional generating plant, and £200,000 for extensions of electric mains.

London.—St. Pancras.—Mains extensions at a cost of £592 have been sanctioned.

Messrs. Bruce Peebles & Co. quoted £7,250 per set for two motor converters for the Regent's Park station. This is an increase of £900 per set on their contract price for similar plant ordered for the proposed new sub-station in Prince of Wales Road in the previous March. The quotation was not accepted, but there are two similar sets on order for the proposed new sub-station, one of which is a spare set. It will, therefore, be installed at the Regent's Park station to serve the present needs. Tenders are to be invited for two new boilers for the King's Road station. The chairman of the Electricity Committee (Alderman F. L. Combes) has been appointed as the Council's representative on the executive committee of the Conference of Local Authorities owning electricity undertakings in Greater London.

Malvern.—Mains Extensions.—Subject to a loan being secured, the Urban District Council has decided to extend the mains to West Malvern at an estimated cost of £4,500, on condition that guarantees are given representing 7 per cent. on the outlay for five years.

Pontefract.—Provisional Order.—The Rural District Council has received notice of the intention of the Electrical Distribution of Yorkshire, Ltd., to apply for a provisional order to supply electricity in the district.

Portrush.—Loans.—The Urban Council having applied to the Local Government Board for Ireland for sanction for loans towards, among other things, constructing electricity supply works, Mr. A. D. Price, one of the Board's engineering inspectors, has been appointed to hold the usual official inquiry.

Shrewsbury.—Year's Working.—The total income from the electricity undertaking for the year ended March 31st last was £16,821 ; working expenses were £12,617, leaving a gross profit of £4,203. After payment of £777 for interest on loans and £2,711 for sinking fund charges, there was a net profit of £713.

Loan.—The Town Council has applied for a loan of £4,000 for mains, services, and retrospective expenditure.

Stafford.—Extensions.—Extensions involving an estimated expenditure of £80,000 are to be carried out at the electricity works. Tenders for brickwork and the erection of a new boiler house and extensions to the power station have been accepted.

Sudbury.—New Station.—There was a large attendance on July 23rd at a public meeting in connection with an electricity project for the town. The Mayor (Alderman H. Alston), who presided, on behalf of the Town Council and the inhabitants, gave the undertaking his benison. Mr. Napier Prentice, A.I.E.E., said Sudbury was a town where cheap power was essential if they were to carry on their present industries with success, and encourage others to come amongst them. The want of this power made not a few industries go north. What the company wanted was the goodwill of the inhabitants, whom they asked to allow the tops of their houses to be used for the carrying of wires. They had, of course, the right to object, but in that case application might be made to Parliament to pull the streets about for the laying of cables. That would be very expensive, and increase the cost of power and light. They had bought the necessary land for a power house, and intended to start a supply as soon as possible. Mr. C. H. Wordingham, C.B.E., Past-President of the Institution of Electrical Engineers, pointed out that there were great advantages in a company undertaking the supply in a small town, especially where the business was to a very large extent speculative, for a municipality could not stand the loss of a new undertaking in its initial stages. The company was prepared to place at the disposal of the town for this scheme the technical and commercial knowledge and ability, which a municipality could not afford to pay for. Mr. P. C. N. Peddar, chairman of the company, in the course of his remarks, said that 23 or 24 years ago, he and Mr. Prentice established a company in Stowmarket, where he thought there was hardly a man to-day who would not thank them for what they did. They did not depreciate the gas shares, and some of the largest consumers of electricity were gas shareholders.

Tunbridge Wells.—Loan.—The Town Council has decided to apply for a loan of £1,500 for two superheaters, &c., for the electricity works.

Walsall.—Mains Extensions.—The Electric Supply and Housing Committee recommends that electric lighting be provided for the whole of the houses to be erected at Blakenall ; that an expenditure of £3,935 be authorised for the necessary distributors, &c. ; and further, that mains be extended at an estimated cost of £1,565, and that the Council authorise a further expenditure estimated at £5,000 for necessary feeders, &c. The Mayor (Councillor H. H. Tucker) said he was alarmed at the expense involved, amounting to nearly £17,000, whilst the estimated income was only £1,400 per year.

Wolverhampton.—On the invitation of the chairman of the Corporation Electricity Committee (Councillor Thompson), the members of the Town Council on Thursday last week paid a visit to the Corporation electricity generating station at Commercial Road. Very extensive additions have been made to the station, and a considerable amount of constructional work has also been carried out recently. These alterations were fully described in our last issue. A numerous company assembled, and after a tour of the works, the members of the Council congregated in the offices. Here Sir Charles Mander, who was chairman of the Electricity Committee when the works were opened by Lord Kelvin in 1894, proposed a vote of thanks to the chairman. He mentioned that the capacity of the plant at that date was a meer 700 H.P., while at the present moment it was 30,000 H.P. Councillor Thompson, responding, thanked the Council for the support it had given to the Electricity Committee. At the moment, he said, the plant could produce about twice as much power as it was doing, and if the use of electric power grew, as he thought it would, they would soon want a works as big again. The plant had cost three quarters of a million, of which a quarter of a million had been written off. Mr. S. T. Allen (borough electrical engineer) said he was very optimistic about the future of the works. If there was one thing about Wolverhampton that he would like to condemn, it was the spirit of pessimism that was shown in some quarters. He was proud of the town, and saw great possibilities ahead. Wolverhampton was attractive to new industries, and possessed all the advantages of Birmingham and the Black Country without any of their disadvantages. Mr. Allen, in closing, paid a fitting tribute to his staff.

Wrexham.—Loan.—An inquiry was held on July 27th respecting the application of the Town Council for a loan of £17,260 for a boiler, economiser, buildings, water softener, &c.

TRAMWAY AND RAILWAY NOTES.

Brazil.—Railway Electrification.—After prolonged negotiations, the Paulista Railway Co. has placed an order with an American company for the electrification of part of its system, says *The Times Trade Supplement*.

Continental.—Spain.—Lisbon is again without a tramway service, owing to a dispute between the Municipal Council and the company.

Croydon.—Fare Revision.—The revised fares on the Corporation tramway system will allow a passenger to travel a distance of ¾ mile for 1d.

Dublin.—Breakdown.—A serious interruption of the electric tramway system occurred one morning last week through a breakdown of the overhead wires.

East Ham.—Loan Sanctioned.—The Town Council has received sanction to a loan of £8,373 for the purchase of equipments for 10 new tramcars.

Electric Vehicles.—The Ilford Urban District Council has received sanction to a loan of £8,500 for the provision of electric vehicles for refuse collection.

Halifax.—Fare Increase.—The Tramways Committee has recommended an increase in the tramway fares. It is proposed to charge 1½d. for the first mile on the routes radiating from the centre of the town, though existing 2d. stages will remain unaltered. Stages outside the town will be increased 100 per cent. on pre-war rates, and motor-'bus fares by 50 per cent. on existing rates. The changes are subject to sanction by the Corporation, and the Corporation Bill receiving the Royal Assent.

Japan.—Railway Electrification.—The Department of Railways, which has planned the erection of a power station at Akabane, will use the power generated to operate electric trains on several sections radiating from Tokio. At Yokokawa, near Karuizawa, the Department plans to erect a water-power station. —*Reuter's Trade Service*, Tokio.

Leeds.—Year's Working.—The annual report on the city tramway undertaking for the year ended March 31st last, shows that the receipts amounted to £876,527, an increase of £153,493 on the previous year, the earnings per car-mile averaging 21·28d., compared with 18·95d. Working expenses amounted to £606,347, an increase of £184,938. After providing for interest on loans, redemption fund, &c., the net surplus profit of £83,758, compared with £90,000 last year, was transferred to the relief of the rates, the amount utilised in this manner to date being £1,376,776. Traffic expenses increased by £90,845, and general expenses by £14,712; general repairs and maintenance increased by £58,733, permanent-way repairs have cost £28,199 more than last year. Heavy expenditure was rendered necessary, owing to overdue renewals of track. The extra cost under the heading of "cars" was £22,708; 30 extra cars were placed in service during the year. The increase in "power" expenses amounted to £18,322; cost of energy generated was £61,783, or 1·26d. per D.C. KW.-hour, and 1·09d. per A.C. and D.C. KW.-hour; cost of energy purchased was £39,494, or 1·13d. and 0·99d. Amount of D.C. generated at 500 volts was 224,410 KW.-hours; A.C. generated at 6,600 volts, 13,378,300 KW.-hours; A.C. purchased at 6,600 volts, 9,517,999 KW.-hours. Coal consumed amounted to 18,924 tons, or 3·116 lb. per unit generated. The number of passengers carried increased by 16,314,061 to 136,567,011. During the year the parcels department grew considerably; 183,676 parcels were dealt with, compared with 39,032 last year. The number of passengers carried on the railless traction section of the undertaking was 1,047,541; the receipts were £11,510, against £9,304 last year, and the working expenses totalled £9,878, or 13·36d. per car-mile.

Liverpool.—Loan Sanctioned.—Sanction has been received by the Corporation from the Ministry of Transport, for the borrowing of £18,350 for the purchase of the Liverpool and Prescot light electric railway undertaking. The amount is to be repaid within 30 years.

Accident.—Two point cleaners were knocked down and seriously injured by a light electric train outside the Exchange station on July 30th. One man was pinned under the train, and two hours elapsed before the coach was raised and he could be released.

London.—L.C.C. Fare Revision.—Subject to the approval of the Ministry of Transport, the London County Council has adopted a new maximum scale of tramway fares. The 1d. fare distance will be reduced from 1·2 miles to 0·6 mile, converting the present 1d. fare into 1½d. The deficiency on the tramway undertaking this year may exceed £1,000,000. The increases will not be put into operation before September 25th.

East Ham.—The Medical Officer of Health reports that the overcrowding on the District Railway causes a good deal of ill-health in the borough.—*The Times*.

Manchester.—Works Committee.—A mass meeting of tramway depôt workers in Manchester decided to set up a Works Committee representing the three depôts in the city, and having power to appoint shop stewards, who in turn will have power to deal with petty grievances. They will exercise no executive powers beyond interviewing the depôt foremen. By this means it is hoped to bring about a greater degree of contentment amongst the men. Any grievance which cannot be settled between the shop steward and the foreman will be brought by the district secretary before the management in the usual way.

Middlesbrough.—Extensions.—The Corporation has again rejected the suggestion that a conference should be held with Stockton and Thornaby, with the object of establishing a joint control of tramways in the respective areas (to be taken over shortly from the Imperial Tramways Co.). Speaking recently, the Mayor of Middlesbrough (Councillor E. Spence) said he believed the town would have to subsidise the tramway system when it got it.

A Sub-Committee of the Tramways Committee has been appointed to consider various sites for a depôt, and the tramway manager and the borough engineer have been instructed to consider the planning of future tramway routes consequent upon the development of the town.

Motor-'Bus Taxation.—The Ministry of Transport has given an important decision on the subject of damage to roads by motor-'bus traffic. Three local authorities in South Durham—the Darlington Rural Council, the Auckland Rural Council, and the Shildon Urban Council—granted permission to the United Automobile Services, Ltd., which has arranged an extensive service of omnibuses in the area, to run over new routes on payment of 2d. per 'bus-mile. The company appealed to the Ministry against the impost, on the ground that it was unjustifiable. The Ministry has decided, after hearing the evidence of both sides, that the charge of 2d. per 'bus-mile is a reasonable one, and must be paid pending the passing of legislation authorising the taxation of motor vehicles, when the question will be reviewed as from the beginning of the present year.—*Birmingham Post*.

Newport (Mon.).—Strike.—The strike of tramway permanent-way men extended on July 28th to the power station employés; the cars are not running, and the town is without electricity supply. The permanent-way men ask for 2s. 1d. per hour. The Mayor has repeated his promise of a conference if the men resume work.

Newcastle-upon-Tyne.—The Minister of Transport has extended until August, 1921, the time limited by Sec. 7 of the Newcastle-upon-Tyne Corporation Act for the completion of tramways.

St. Helens.—Fare Increase.—The Minister of Transport has issued an interim order authorising the modification of the statutory charges in respect of the tramways. As a consequence, the Tramways Commission has given notice of a general increase of fares, one basis of which is a rate of 1½d. per mile, or part of a mile, with a slight concession to passengers travelling four miles or more.

Loan.—The Minister of Transport has sanctioned the borrowing of £2,500 by the Tramways Committee for the purchase of top covers for four tramway cars. At present none of the tramcars have top covers, due mainly to the lowness of the bridges on certain of the routes.

Venezuela.—Extensions.—The tramways of Maracaibo have been sold to a syndicate composed mostly of United States financiers. The purpose is to extend and improve the existing system, says *The Times Trade Supplement*.

York.—Fare Increase.—The costs of working the tramway undertaking are growing to such an extent that the Committee proposes to apply for power to charge a universal 2d. fare, except with respect to special cars.

TELEGRAPH AND TELEPHONE NOTES.

France. — International Communication. — At the instance of the Communications Section of the Supreme Economic Council, a Conference, says the *Manchester Guardian*, has been held in Paris of postal, telegraph, radio-telegraph, and railway experts of various European countries for the purpose of improving communications as a help in the economic reconstruction of Europe. The Telegraph Sub-Committee decided upon a list of additional international telegraph lines, and reached agreement as to degree of urgency attaching to each. It is expected that the arrangements will result in considerable improvement in the telegraph service between Western and South-eastern Europe. In considering facilities available for wireless communication between European countries and the possibility of increasing them, the Radio-telegraph Sub-Committee expressed the opinion that within the limits of Europe radio-telegraphy should be regarded as an extension of the ordinary telegraph system, and used interchangeably with it according to the needs of the moment, and at the same rate, senders being given the option of objecting to this course by marking their telegrams "fil" (meaning wire). At the instance of the British delegates, however, the right was reserved to any two countries to make other arrangements regarding wireless communication between themselves when this could be done without affecting the interests of other administrations. Certain suggested alterations in international wireless regulations were also considered.

Telegraphic Photography.—Two machines for transmitting photographs or autograph writing "by telephone" have been ordered by the Italian Government from M. Belin, a French scientist. They will be used for instantaneous reproductions of handwriting between Milan and Rome. The French Government has also ordered two similar machines for experimental purposes. The device weighs 20 lb., and can be fitted on any telephone.—*Daily Mail.*

Germany.—New Cable.—In order to make telegraphic and telephonic communication with East Prussia independent of Poland, a cable has been laid between East Prussia and the Pomeranian Coast, and will be ready for use about the 4th prox. The cable, which begins at Lebal (Pomerania) and ends at Tenkitten (East Prussia) is 170 kilometres in length.—*Reuter's Trade Service*, Berlin.

North Borneo.—Wireless Telegraphy.—At the half-yearly meeting of the British North Borneo (Chartered) Co., held in London last week, Sir West Ridgeway (president, in the chair) is reported by *The Times* to have said that the wireless system was working most efficiently. Uninterrupted communication was maintained between all the stations throughout the year 1919, except for a day and a half, when the Sandakan station was closed for transmission. Public messages for 1919 showed an increase of 33 per cent. on the figure for 1917, and 16 per cent. on that for 1918. The inauguration of a wireless service between Jesselton and Sarawak had been followed by the establishment of regular wireless communication between North Borneo and the Philippine Islands.

Private Wireless Installations.—Messrs. R. S. Dalgliesh, Ltd., coal exporters and shipowners, Newcastle-on-Tyne, have been refused permission to install a private wireless set for communication with their ships. The Post Office says that an adequate system of coast stations is in existence, and that the station at Cullercoats serves shipping using the Tyne. Private stations, the Post Office adds, would entail heavy loss to the State by the withdrawal of traffic from State-owned wireless stations, and would cause "great confusion and interference."—*Daily Mail.*

Ships' Wireless.—New Rules.—The Merchant Shipping (Wireless Telegraphy) Act, 1919, and the rules made by the Board of Trade thereunder, and dated July 15th, have been published (price 3d.), and will, says the *Board of Trade Journal*, come into operation on September 1st next, as regards vessels registered in the United Kingdom. The Act and the Rules will apply to other ships trading to ports in the United Kingdom on December 1st, 1920, as provided in Sec. 2 of the Act. This means that after December 1st, 1920, all passenger steamers and all cargo steamers of 1,600 tons gross, and upwards, whether British or foreign, which come to this country will be required to be fitted with a wireless telegraph installation and provided with operators and watchers in accordance with the Rules.

South America.—New Wireless Station.—The Argentine Government has issued a decree allowing the Marconi Wireless Co., as stated in our pages some months ago, to install a high-powered wireless station to be used exclusively for communication between the Argentine and Great Britain.—*Reuter's Trade Service*, Buenos Ayres.

The Telegraph Service.—Sunday Telegrams.—The second reading of the Postmaster-General's Bill to sanction increases in postal and telegraph charges not included in the Budget, was agreed to in the House of Commons on July 28th. It was explained that telegraph clerks being paid time and-a-half for Sunday duty, it was proposed to charge 6d. extra for Sunday, Good Friday, and Christmas Day telegrams.

Government Telegrams.—In reply to a question in the House of Commons last week, the P.M.G. explained that during 1919, the number of telegrams exchanged between the United Kingdom and India was 629,571, of which 71,142, or 11·3 per cent., were Government messages. They did not necessarily have priority over private telegrams, only in urgent cases. If sent by a company, he imagined such telegrams would be paid for at the ordinary rates.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review, *in which the "Official Notice" appeared.*

OPEN.

Australia. — Commonwealth Government. November 24th. Protected cable terminals and cable distribution boxes. Specifications &c., will be available at Australia House, Strand, W.C.—*Reuter's Trade Service.* (Brisbane).

Belgium.—August 11th. The Société Nationale des Chemins de Fer Vicinaux, of Brussels (48, Rue Montoyer, Service Electriques). Armoured underground cables required (1) for the Brussels-Haecht line and (2) for the Gilly-Hansart line.

August 14th. The Belgian State Railway authorities, at La Salle de la Madeleine, Brussels, are inviting tenders for the supply of 36 lots of material required in connection with the Stone electric train lighting system.

Birmingham. — September 1st. Salvage Committee. Two 100-kw., 440-v., D.C., compound-wound, steam-driven generating sets, complete with surface condenser and switchboard. (July 30th.)

Blackpool.—August 27th. Corporation. Two water-tube boilers, superheaters, economisers, stokers, &c.; two sets of induced draught plant; coal conveying, &c., plant. (July 16th.)

Bradford. — September 9th. Electricity Committee. Contract R. 159. No. 4 boiler house and equipment, including buildings, water-tube boilers, economisers, induced draught plant, feed pumps, coal-handling plant and piping systems. (See this issue.)

Bridgwater. — August 10th. Town Council Electric Light Installation, Town Hall and Municipal Buildings. Borough Surveyor. (Returnable deposit of £2 2s.)

Chile.—February, 1921. The Chilean Legation at Paris (23, Avenue du Bois de Boulogne) is asking for tenders for the supply and installation of electric power in the first zone of the Chilean railways. Sealed tenders are returnable before February 1st, 1921.

Edinburgh.—September 6th. Electricity Department. Converting plant for Portobello generating station and sub-station. Specification No. 26. (See this issue.)

Grimsby.—August 12th. Electricity Department. Two water-tube boilers, economisers, fittings, fans, chimneys, &c.; one 3,000-kw. high-pressure turbo-alternator and condensing plant. (July 2nd.)

Manchester. — August 13th. Electricity Committee. One each 75-ton and 15-ton electric cranes for Barton power station. (July 23rd.)

August 30th. Electricity Committee. Barton power station: Cable manufacture and laying 33,000-volt, 3-phase trunk feeders (26 miles), pilot cables (104 miles), telephone cables (19 miles). Specification B. 7. (See this issue.)

September 20th. Electricity Committee. Six 33,000-volt, 19,500 k.v.a., 3-phase static transformers, house service and testing transformers. (See this issue.)

Portsmouth. — August 17th. Tramways Committee. Stores for twelve months, including insulating materials, overhead line equipment, &c. (July 30th.)

August 25th. Electric Lighting Committee. One 4,000-kw. turbo-alternator; two water-tube boilers, each of 30,000 lb. per hour capacity. (July 30th.)

Uganda.—December 20th. Government of the Uganda Protectorate. Tenders invited for a concession of a portion of the Ripon Falls of the Nile. See this column in our issue of July 30th.

Warrington.—August 10th. Electricity and Tramways Committee. Coal elevator and conveyor. (July 9th.)

September 7th. Electricity and Tramways Committee. Surface condensing plant. (See this issue.)

CLOSED.

Belgium.—A new feature of the electric cable business in Belgium was the receipt last week of a tender from a Spanish company for the supply of cables to the municipal authorities of Schaerbeek, Brussels. The lowest bids, however, came from Belgian concerns.

Folkestone.—Electricity Committee :—

Electric light installation.—North and Sidney Street Schools; Webster and Son, £181.

Great Yarmouth.—We have received the following list of tenders submitted for the electrical installation at Grundy's Net Works, Great Yarmouth :—

Mann, Egerton & Co.	£747
Wembly Heating Co.	608
Bower & Barr	500
Cunningham, Ltd.	480
Gray & Palmer (accepted)	**460**

Liverpool.—Tramways, Electric Power and Lighting Committee. Accepted :—

Sutton Heath and Lea Green Collieries Co., Ltd., for a minimum quantity of 60,000 tons of steam slack to the Lister Drive electric power station.

The Corporation has accepted the offer of the Hammersmith Borough Council to purchase a 2,000-kw. generating set at Lister Drive power station, for £3,500. Messrs. Madden, McKee, Ltd., have bought from the Corporation the other 2,000-kw. Westinghouse generating set from the same station at £2,300.

Electricity Committee. Recommended :—

Transformers to the extent of 10,000 kw. during the next 12 months.—British Electric Transformer Co., Ltd.

London.— St. Marylebone.—Electricity Committee. Recommended. Plant extension scheme :—

Boilers and high-pressure steam piping—	
Babcock & Wilcox, Ltd.	£8,380
Alton & Co., Ltd. (recommended)	**7,737**

Feed water tanks.

Whessoe Foundry and Engineering Co., Ltd.—Two boiler feed tanks, £2,290; and two hot well tanks, £843. (Recommended.)

Monaghan.—Accepted.—Electric lighting installation at St. McCartan's Cathedral, McCartan's Seminary, and at the residence of the Bishop of Clogher.—J. J. Woods.

Stafford.—Town Council. Accepted :—

Brickwork in connection with the electricity works extensions, £1,640.—Poulton & Son.

Erection of new boiler house and the extension of the existing power station, £5,104.—Blair & Lyell.

Wolverhampton.—Town Council. Accepted :—

Two oil switches, &c., £700.—A. Reyrolle & Co., Ltd.

Eight single-deck tramcars, £14,781.—Brush Electrical Engineering Co., Ltd.

Three double-deck tramcar bodies, £6,462.—English Electric Co., Ltd.

Sixteen 349a motors for use on the tramcars, £5,076.—British Thomson-Houston Co., Ltd.

NOTES.

Electrical Supplies in South Africa. — The *S.A. and Mining and Engineering Journal* for July 10th, states : "Dealers advise that electrical materials are now coming in fairly freely, more particularly fittings, which are very welcome after the late acute shortage. Wood blocks, which have also been in great demand recently, are also coming in plentifully. Notwithstanding the influx of electrical goods, it is not expected that prices will recede, but rather, in view of the numerous uncompleted orders on hand, that prices will go even higher. As a matter of fact, the past week has witnessed a rise generally in electrical goods. Lamps are now 27*s.*, 28*s.*; lampholders, ceiling roses and adaptors, being practically unprocurable, are unquotable."

Electricity Supply Districts.—In view of the numerous applications received by the Electricity Commissioners for maps of the Electricity Districts already provisionally determined by them, arrangements have been made whereby copies can be supplied to those interested at a charge of 2*s.* per copy, inclusive of postage. Applications for copies should be made in writing to the Secretary, Electricity Commission, Gwydyr House, Whitehall, S.W. 1, and should be accompanied by the necessary remittance.

Educational. — City and Guilds (Engineering) College.—The Council of the City and Guilds of London Institute has awarded diplomas of "Associate" to the following students who completed a full course of instruction in engineering at the close of the recent session :—

R. H. Allen, W. de Ascanio, W. G. Ayerst, R. Baillie, T. N. Baines, L. H. Bedford, D. Beresford, H. Bishop, F. la T. Budgett, T. S. Blair, W. A. Bowden, J. H. W. Buckell, S. T. Burkitt, F. W. Butler, R. H. Carter, A. R. Chapman, O. H. Chilton, S. Clifford, L. P. Coombes, E. de Cousinery, G. C. Cowie, W. Cramer, H. F. Cronin, J. Cushny, G. W. Davis, J. S. Davis, A. Day, A. J. Dean, G. E. Dovaston, W. A. Dovaston, E. Downes, F. T. Edmunds (Henrici Medal), V. M. Falkner, J. M. Fenton, L. B. Firnberg, R. Fraser, R. Gabel, G. H. Glasspoole, R. T. W. Goodman, L. V. Gordon, H. J. Gowring, E. R. Green, J. W. Grose, T. F. B. Hall, H. A. Harris, M. Van Hasselt, F. B Haward, F. R. Heading, R. F. Highett, B. A. C. Hills, L. T. Hinton, H. W. Hodge, E. G. Holley (Siemens Medal), J. E. Holmstrom, T. F. Hurley, R. T. James, J. P. Johns, E. M. R. Jones, E. R. Jones, G. B. King, W. Y. Lee, W. H. Lobjoit, A. Macculloch, J. C. Macgregor, E. N. Macqueen, G. W. Martin, J. D. Maughan, A. E. May, R. C. McLeod, A. McVie, A. McL. Mooney, D. W. Morphy, F. D. Moul, M. Nachshen, H. F. Naish, E. J. Naylor, A. L. Paget, A. Pearlman, H. Peters, P. L. Pomary y Tenaud, R. D. Ringang, B. G. Robins, K. Rowell, F. D. M. Ryves, E. M. Shipman, W. E. E. Sich, W. F. Simonson (Bramwell Medal), A. Stavridi, M. Stern, S. G. Stevens, C. G. Sturt, A. H. Swann, B. W. O. Townshend, E. H. Turner, B. Tutleman, H. C. Vereker, E. H. Webster, D. Whyte, R. A. Wilson-Jones, L. J. Wood.

Institution of Electrical Engineers. — Students' Scottish Visit.—The London students of the Institution visited Glasgow last week, and spent a delightful time in sight-seeing, in addition to visiting a number of works in the district, and inspecting power plants. The party, numbering 40, was received on arrival by the Scottish Students' Section, which entertained the visitors at a social meeting, when they were welcomed by Mr. J. E. Sayers. On Wednesday a visit was paid to the Corporation's Dalmarnock power station, as well as the Dykehead Colliery, Larkhall, and the Summerlee Iron Co. On Thursday the works of Messrs. Mavor and Coulson, electrical engineers, Glasgow, and the engineering laboratories of the Royal Technical College and the University were inspected, while on Saturday the party was shown over the works of Messrs. G. & J. Weir, Cathcart, and Messrs. John Brown & Co., Clydebank. The programme also included sails to Rothesay and Arran.

Electricity and Public Health.—An informative lecture, on popular lines, on the hygienic value of electricity, aroused a good deal of attention at the Birmingham Health Exhibition [see Electrical Review, July 30th, page 157]. It was given by Mr. W. Y. Anderson, the commercial engineer of the Birmingham Corporation electricity supply department, who pointed to the rapidly-growing use of electric labour-saving appliances in the home, which were gradually solving the servant problem. It was surprising, he said, how few persons really appreciated the value of electricity as a servant to mankind, there being only a hazy notion of its importance. The position that a nation held was in direct proportion to the significance it attached to the solution of the problems of industry, physique and education. Electricity was, perhaps, the greatest factor which enabled a nation to find a satisfactory solution to these questions. Electricity was no longer a luxury, it was a necessity; few persons could, in fact, afford to do without it. In industry and in the home it was the enemy of disease because of its cleanliness, dirt and dust being reduced to a minimum. There was, too, an enormous saving in the upkeep of a house, and in the outlay on its internal decoration, where electricity was used, and he believed that in the future, when the house shortage had been dealt with, there would be as much difficulty in letting a house which was not electrically equipped as there was in letting one that had no bathroom.

Legal.—Battery Refills Dispute.—In the City of London Court last week, before Mr. Assistant Registrar Tattershall, a claim was made by Calmont King & Co., Ltd., electrical engineers, 84, Milton Street, E.C., against Mr. George Smith, of the Royal George Motor and General Repair Works, 79, Myddleton Road, Bowes Park, for the sum of £4 10*s.*, balance of account for battery refills supplied. Mr. Harry Strouts, solicitor, appeared for the plaintiffs. The Assistant Registrar said the case would have to be adjourned for a proper detailed account to be made out, showing what goods had been supplied and those returned. In the meantime he thought the parties should put their heads together and come to a settlement. If no settlement was arrived at, the case would be gone into upon proper accounts being filed.

Appointments Vacant.—Head of the Electrical Engineering Department (£500), assistant lecturer in Electrical Engineering, assistant lecturer in Mechanical Engineering, at the Rutherford Technical College, for the Newcastle-on-Tyne Education Committee; mains superintendent, for the Bermondsey Borough Council Electricity Department; plumber-jointer, for the Derby Corporation Electricity Department; assistant control engineer (£313), for the Yorkshire Electric Power Co.; shift engineer (94*s.*), for the Rawtenstall Corporation Electricity Department. See our advertisement pages to-day.

The Institution of Civil Engineers and Salaries.—The Council has issued a statement pointing out that many members of the Institution who hold official salaried positions have suffered hardship through increased cost of living without corresponding advances in the salaries paid to them. This has been especially felt by the junior members of the profession. The Council has drawn the attention of the members to this subject, in the hope that all of them who are able, will use their influence with both public and private employers to secure their practical sympathy in remedying what is an undoubted hardship.

The Coolidge Lamp Patent.—The Coolidge wrought-tungsten patent, under litigation for nearly five years, has been declared valid in all of its claims, and to have been infringed, in a decision handed down on June 29th by Hugh M. Morris, Judge of the United States District Court, in the matter of suit brought by the General Electric Co. against the Independent Lamp and Wire Co., Inc. Considerable importance is attached to the outcome of the case, because of its fundamental application to the manufacture of incandescent lamps. In the opinion of the Court, the solution of the tungsten problem involved invention, and in that invention the specific problem was to make tungsten ductile and eliminate brittleness. It has been held that Dr. Coolidge accomplished this in the production of his wrought tungsten from the natural tungsten metal. The main product and process claims are held valid in the Court's opinion.—*Electrical World.*

In this country the patent has been declared invalid, but an appeal is in process of decision. An appeal has also been lodged against the foregoing judgment in the U.S.A.

Lignite Coal and Spontaneous Combustion.—In an article by Mr. A. W. Morgan in the *Electrical World* of July 10th, it is stated that raw lignite cannot be stored safely, as it takes fire quickly from spontaneous combustion. At a new power station at Denver, which is 30 miles from a large lignite field, the fuel is delivered and burned within 24 hours. The bunkers take the shape of ferro-concrete pockets, each capable of holding only one day's supply for one boiler (75—80 tons). These bunkers have to be emptied when a boiler is laid off; failure to do this has caused two bad fires,

Power-Factor Definitions.—At a Convention of the American Institute of Electrical Engineers, last month, reported in the *Electrical World* of July 10th, one of the subjects discussed was the definition and measurement of power factor in polyphase circuits. A Joint Committee of the N.E.L.A. and A.I.E.E. had put forward two definitions, namely :—(1) Power factor in a polyphase circuit is the ratio of the total watts to the arithmetical sum of the volt-amperes in the several phases, each measured to a non-inductive neutral point. This definition may be otherwise expressed as the weighted mean of the individual power factor in the phases (weighted according to the volt-amperes in each phase); (2) power factor in a polyphase circuit is the ratio of the total watts to the vector sum of the volt-amperes in the several phases. It was pointed out that definition 2 was mathematically accurate, but definition 1 had a broad field of usefulness when applied to unbalanced circuits. All power companies had come to the conclusion that they must penalise low power factor, the greatest obstacle to this being the chaotic condition of metering. Strong support was given to the second definition, as this gave results which were entirely independent of the question of unbalancing; on the other hand, it was urged that there was no such thing as the power factor of a polyphase circuit; power factor and unbalance factor should not be conbined in one factor. Finally, it was agreed that polyphase power factor should be defined as the ratio derived from the active power and the reactive power, and the Committee was instructed to devise definitions on the basis of the discussion.

Electrical Precipitation for Silver Fumes.—The electrical method of precipitating fine particles is especially useful in connection with metal refineries, because of the high value of the materials recovered. An installation has recently been made in the silver refinery of the United States Metals Refining Co., Chrome, N.J., which is of special interest, because it represents both a successful commercial installation and an advanced development of precipitating apparatus for this kind of service. Installations of this type present many engineering difficulties, for not only must practically 100 per cent. of the fumes be recovered, since every particle escaping represents a financial loss, but the material precipitated in the tubes is particularly troublesome. This substance is not a fine, dry, easily-handled dust, but a semi-liquid sludge, that is hard to remove, and is especially liable to build up on the electrodes and cause earths. It also contains a considerable percentage of selenium compounds, which not only attack iron and steel, but ordinary commercial lead also, and only lead free from antimony can withstand destruction from the selenium-carrying gases. Hence, every part of the equipment with which the fumes come in contact must be covered with chemically pure lead. According to the *Electrical News*, the treater installation consists of three units of 30 lead-lined tubes each. The electrode system, in this case at 65,000 volts, contained in the tubes is rigidly suspended from the top, so that bottom insulators can be dispensed with. The gases from the furnaces are first passed through scrubbers and sprayers, which remove a portion of the fumes and cool and moisten the gases to the proper degree. They then pass into the top of a large header, into which the precipitating tubes project several feet, so that irregularities in the gas flow are broken up, all the pipes are heated to the same temperature, and a uniform flow is established through each pipe. After passing through the pipes, the gases now free from fumes, escape into the atmosphere. As soon as the maximum permissible amount of precipitation has taken place in the pipes of any unit, the gas flow and the electric current to that unit are cut off, and the precipitate is flushed out of the pipes by a washing system. The electrical equipment consists of a motor-generator set, a high-voltage transformer, and a mechanical rectifier. The motor-generator set is made up of a 40-H.P., 220-volt Westinghouse D.C. motor, and a 25-K.V.A., 220-volt, 60-cycle Westinghouse A.C. generator. The motor is driven from the power circuit of the plant and the generator supplies the current for the precipitation system. The low-voltage current from the generator goes to the transformer, which is of a special design made by the Westinghouse Co. It is of 25 K.V.A. capacity; takes low voltage current at 220 volts, and has taps in the low tension winding for transforming to 55,000, 65,000, 70,000, and 75,000 volts respectively. After the low-voltage A.C. has been transformed to high-voltage it goes to the mechanical rectifier, which is a simple form of commutator, and is kept in synchronism with the current by being mounted on the generator shaft.

Repairing Motor Coils.—Much time may be saved by using sheets of varnished cambric between the overhanging ends of motor coils instead of wrapping them with tape. In a U.S. repair shop, says the *Electrical World*, a triangular strip of the fabric is cut out of the sheet and inserted under the end of each coil, with an extra one between phases; when all the coils are in place, the fabric is trimmed to the shape of the coil.

U.S.A. Nitrate Plant.—The U.S. nitrate plants, located at Sheffield and Muscle Shoals, Ala., were constructed during the war for military purposes. At the time the armistice was signed, plant No. 1, using the synthetic ammonia process, was only in the experimental stage, but plant No. 2, using the cyanamide process, was ready for production. A Bill has been placed before the Senate Committee on Agriculture and Forestry, authorising the establishment of the U.S. Fixed Nitrogen Corporation, the stock to be owned by this corporation, to purchase and operate the plant for the production of nitrogen fertiliser compounds. No. 2 plant will be used for this purpose, while No. 1 plant will be used to further development and research. It is estimated that $12,500,000 will be required to finance the corporation.

The Fixation of Nitrogen in Arc Furnaces.—The technique of fixation of nitrogen in the form of oxides, produced with the electric arc, has remained almost unchanged since the construction of the first works. Mr. Ferdinand Gros has made some industrial experiments which have led to improvements which he regards as of importance, and which give hopes of others.

Hitherto the best industrial yields have represented 55 to 65 grammes of nitric acid NO_3H per kilowatt-hour, the average production of several works being often less; even as low as 45 grammes. These yields are obtained by conveying atmospheric air into the furnace, *i.e.*, humid air. Leaving the furnace, the air containing nitrogen oxides, passes into a system of oxidation chambers and large towers where, in contact with water or alkaline solutions, it gives off the nitrogen oxides. Thus nitric acid or nitric or nitrous salts are collected (usually a mixture of both) in the form of low-percentage solutions which must subsequently be concentrated and transformed into commercial products. The efficiency of the absorption plant is never complete, so that the gases which escape into the atmosphere, on leaving it, carry away a portion of the nitrogen oxides which is thus lost.

The yield of 65 grammes NO_3H per kilowatt-hour corresponds to the formation of 31 grammes of NO in the furnaces, only utilising 22 calories, each kilowatt-hour being equivalent to 860 calories. The result is that 2.5 per cent. only of the electrical energy is employed for the production of NO. The other 838 calories serve to heat the gases treated. Only a small part is recoverable, which can be utilised for the evaporation and concentration of the solutions mentioned. Some manufacturers maintain that only 30 per cent. of the calories conveyed in the gases are recoverable in the boilers.

This poor utilisation of electrical energy is not so far as one might think from the theoretical limit for work with humid air. It is in fact estimated that it is hardly possible to exceed a production of 120 grammes of NO_3H per kilowatt-hour, which represents the utilisation of about 4.8 per cent. of the energy consumed in the furnace. Thus the practical yield is about 6/120=54 per cent. of its theoretical limit.

This calculation also demonstrates that the unfavourable effect of the humidity of the air is far from being negligible, and that the employment of oxygen should result in a greater improvement from the point of view of yield than that generally admitted. For example, with a dry gas, containing 50 per cent. oxygen and 50 per cent. nitrogen, the theoretical limit would be 264 grammes per kilowatt-hour, and this without reckoning the recovery of heat conveyed in the gas. If, thus, the same practical yield of 54 per cent. were attained, the production of the furnaces would be equivalent to 145 grammes per kilowatt-hour, viz., more than double that of the best actual productions.

According to the results obtained in these experiments, applying the principles given (dry gases and high percentage of oxygen), with an industrial plant representing 200 to 300 kilowatts, the accuracy of the opinions previously given was demonstrated. In some conditions of work the yields amounted to 90 grammes of nitric acid per kilowatt-hour. Working with a mixture of dry oxygen and nitrogen, the yield of NO was 50 per cent. greater than with humid atmospheric air. A new series of experiments now being made leads to the conclusion that this yield can be exceeded.

The plant employed comprises a perfectly new type of device for the recovery of nitrous fumes (French application for patent 116,293, August 18th, 1919) by a physical instead of the usual chemical way. The gases give off their nitrogen peroxide in cooling at a low temperature. They circulate in a closed circuit, and consequently remain dry. One has merely to supply the necessary dry oxygen and nitrogen to maintain a specified working percentage.

Owing to the method of recovery adopted the peroxide, NO_2, can be directly transformed into nitric acid with any degree of concentration. Finally, all the recoverable energy in the hot gases is thus freed, and is more than equivalent to that required by cold recovery and manufacture of the requisite oxygen.

These few improvements are calculated to make a profound alteration in the general arrangement of a works for the production of nitrogen oxides, in particular, by allowing, with equal furnace power, considerable reduction in height and surface of the buildings (in some works the height of the absorption plant building is 25 metres), and direct production, in recovery, of a material with high percentage of nitrogen of much greater value than the diluted solutions of nitric acid, nitrates, and nitrites given in actual practice.—*Comptes Rendus*, March 29th, 1920.

A 900-mile Network.—When the hydro-electric power systems of Georgia and Alabama are connected by a transmission line 52 miles long, the extent of the entire interconnection will be about 900 miles. The voltage is 110,000, and the capacity of the line is 22,000 K.V.A.—*Electrical World*.

Manchester Wireless Society.—The ordinary meetings have been suspended as from July 28th, and will be resumed on Wednesday, September 1st, from which date the experiments already arranged for the winter months will commence. Those interested, and wishing to take advantage of these lectures and experiments, are advised to communicate with the Hon. Sec., Mr. Y. Evans, 7, Clitheroe Road, Longsight, Manchester.

A "Wonderful Invention."—We recently drew attention to the ridiculous claims of an "inventor" who, with remarkable effrontery, has revived the moss-grown idea of perpetual motion, under the style of "Automatic Power," and has induced a number of newspapers to print announcements regarding his momentous "discovery," and the miracles which he is going to perform with its aid, "in a very short time." We regret to say that the *Financial Times* has permitted this egregious mountebank to occupy nearly half a column of its valuable space with a recital of his claims—and his portrait!—in the form of an editorial, without even appending the usual "Advt." We think our contemporary would be well advised to forgo the doubtful benefit of such an association; the confidence of the financial public is surely worth more than a few inches of advertising space.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

The *Times* reports that General Sir JOHN MONASH has been appointed manager of the Morwell Brown coalfield scheme, by which it is intended to provide Melbourne and other parts of Victoria with cheap electricity. The appointment is for five years, at a salary of £3,000 per annum.

At the Barrow Town Council meeting on July 26th, the Electricity Committee recommended "That the scale of salaries recommended by the Incorporated Municipal Electrical Association Chairman's Committee be approved, and that the borough electrical engineer be paid a salary at the rate of £950 per annum as from April 1st, 1920." The Mayor (Col. Wadham) said the committee who had made the recommendation corresponded to a Whitley Council. It was a joint committee representing employers and engineers, and the scale of salaries recommended was based on the output of units of the different undertakings. £950 was the salary based on the output from the Barrow works. Coun. Longstaffe considered that it was preposterous to base increases on output. Coun. Barrie, vice-chairman of the committee, said he had attended some of the conferences. It was all very well to find fault with output as a basis, but what else could they take as a basis? It was quite a popular cry to call for payment by results, and payment on output seemed to be something near that. The engineers did not get all they asked for, and the committee, which had the support of the Ministry of Labour, was making what was considered the best recommendation. Considerable discussion followed, in which Ald. Manson said there had been a loss on the electricity undertaking in the past year. The Council rejected the recommendation by 15 votes to 14 votes. The Council approved the grades of the technical staff and the new scale of salaries as submitted by the borough electrical engineer as follows:—

	Grade.	Salary (per ann.)	Present Salary with Bonus. (per ann.)
WORKS STAFF—			
Works Superintendent	3	£523	£420
Constructional Engineer and Draughtsman	7	£380	£300
	rising to 6	to £407	
Assistant Works Superintendent	6	£407	£300
Charge Engineers	8	£349	£276
Junior Charge Engineer	9	£305	£240
	rising to 8	to £349	
MAINS STAFF—			
Mains Superintendent	3	£523	£420
Installation and Mains Assistant	7	£371	£300
Meters and Testing	7	£371	£294
Sub-Stations and E.H.T. Assistant ...	7	£371	£252
CONSUMERS' STAFF—			
Consumers' Engineer	4	£472	£378
Technical Assistant, Consumers' Dept. ...	8	£349	£252

NOTE.—The above salaries are based upon an increase in the cost of living of 125 per cent. over the conditions obtaining in July, 1914, provision being made for adjustment for each complete 15 points variation in such cost. At the present cost of living (150 per cent. above the 1914 figures), the above salaries will be subject to an adjustment varying from 3.6 per cent. on salaries up to £350 per annum, to 2.6 per cent. on salaries between £500 and £550.

The revised salaries operate from June 1st last.

Major W. E. SIMNETT, M.B.E., Assoc.Inst.C.E. (late R.E.), has retired from the direction and editorship of the *Technical Review* on his appointment to direct the Intelligence Branch of the Ministry of Transport.

Leek (Staffordshire) U.D.C. has decided to increase the salary of the ASSISTANT ELECTRICAL ENGINEER by £30 per annum to £250.

After further consideration of the question of the remuneration of the city electrical engineer, the Electricity Committee of the Manchester Corporation recommended the Council to enter into an agreement with Mr. S. L. PEARCE, chief engineer and general manager, whereby for a period of seven years he receives in addition to a salary of £2,500 a year the sum of £1,000 per year for special services rendered in the construction of the Barton station or any other new power station that may be required during the period of the agreement. The recommendation came before the Council meeting on Wednesday this week, and was approved.

Mr. JAMES CLARK, for over twenty years connected with the firms of Ridout & Co. and Ridout & Ratcliff, Ltd., has recently resigned his position as manager. He was presented with a cheque.

Mr. G. G. HAZARD, London representative of Messrs. Siemens Bros. & Co., Ltd., for the past 10 years, has resigned to take up a position on the management of Messrs. C. Wright & Son, engineers, of Edgware, where letters should now be addressed.

Barnstaple T.C. has increased the salary of the ELECTRICAL ENGINEER from £375 to £425 a year.

Mr. H. W. PENDER, of Manchester, has resigned the position that he has held with the Premier Accumulator Co., Ltd., Northampton, for the past thirteen years.

Mr. A. H. SMITH, after 18 years' service with the General Electric Co., Ltd., at Witton and Cardiff, has accepted an appointment with the Commercial Electrical Supplies Co., 8, Westgate Street, Cardiff.

Mr. H. NIMMO, M.I.E.E., &c., who since being disembodied from the London Electrical Engineers, R.E. (T.) has been employed on the Government of Burma, Hydro Electric Survey, has now been appointed, temporarily, officer-in-charge, Hydro Electric Survey, Burma.

Obituary.—MR. W. J. CRAWFORD.—We regret to record the death from drowning, at Bangor, of Mr. Wm. Jackson Crawford, lecturer on mechanical engineering at Belfast Technical Institute.

MR. E. DEWHURST.—The death took place on July 29th of Mr. Edward Dewhurst, who had for about 30 years carried on business as an electrical engineer at the Mount Street Works, Preston. He was 57 years of age.

PROF. JOHN PERRY, F.R.S.—We regret to learn, just as we go to press, that Prof. John Perry, F.R.S., passed away on Wednesday at the age of 70 years. The funeral service will be held at St. Peter's Church, Bayswater, to-morrow (Saturday) at 12 noon. Interment at Wendover Churchyard, 2.15 p.m.

NEW COMPANIES REGISTERED.

Surrey Scientific Apparatus Co., Ltd. (169,325).—Private company. Registered July 28th. Capital, £5,000 in £1 shares. To carry on the business of electricians, electrical engineers, manufacturers of electrical apparatus, comprising electrical, telegraphic, telephone, wireless, scientific, high frequency, electro-medical, and kinematograph instruments and component parts, &c. The subscribers (each with one share) are: J. D. Mackintosh, 63, London Road, Kilmarnock, solicitor; M. Henderson, 71, Dundonald Road, Kilmarnock, C.A. The first directors are not named. Registered office: 101a, High Street, Mortlake, S.W. 14.

North British Premier Electric Welding Co., Ltd. (169,231.)—Private company. Registered July 23rd. Capital, £40,000 in £1 shares. To take over the business of the North British Electric Welding Co., Ltd., to carry on the business of welders of metals or other substances by electrical, oxy-acetylene, or other process, marine, electrical, civil, and mechanical engineers, electricians, founders, ship builders and repairers, boiler makers, owners of boats, ships, &c. The subscribers (each with one share) are: Capt. J. G. de O. Coke, R.N. (retired), Bank Buildings, St. James's Street, S.W.; A. L. Haggerty, Bank Buildings, St. James's Street, S.W., secretary. The subscribers are to appoint the first directors. Qualification, £100. Remuneration, £100 each per annum. Solicitor: E. A. B. Maurice, 46, Parliament Street, S.W.

Hydro-Electric Development Co., Ltd. (169,240).—Private company. Registered July 23rd. Capital, £50,000 in £100 shares. To investigate, develop, or assist propositions or schemes for the utilisation of water power in the generation or production of electricity for power, lighting, heating, or otherwise, in the United Kingdom or elsewhere. The first directors are: Sir Henry Babington Smith, G.B.E., K.C.B., C.S.I., 121, St. James's Court, S.W. (member of London Committee, Agricultural Bank of Egypt, director British Trade Corporation, British Italian Corporation, Ltd., Central London Railway Co., Mortgage Co. of Egypt, Ltd., and Oriental Telephone & Electric Co., Ltd.); G. Mantri Fe, 1, Porchester Gate, Bayswater, W.2 (director British Italian Corporation, Ltd., and Compagnia Italo-Britannica). Secretary: J. S. Barnes. Solicitor: R. R. J. Turner, 115, Leadenhall Street, E.C. Registered office: 12, Nicholas Lane, Lombard Street, E.C.

Delco-Remy, Ltd. (169,225).—Private company. Registered July 23rd. Capital, £50,000 in £1 shares (30,000 7 per cent. cumulative preference). To take over the business of automobile and electrical engineers carried on by W. H. Johnson and W. O. Kennington at 14, Panton Street, W., as "Walter H. Johnson," to adopt agreement with the said vendors and General Motors Corporation. The first directors are: W. H. Johnson, 14, Panton Street, W.; W. O. Kennington, 14, Panton Street, W.; A. P. Sloan, junr., 1764, Broadway, New York (vice-president General Motors Corporation); E. E. Eby, Metropolitan Tower, Maddison Avenue, New York (director Hyatt, Ltd.); J. H. Wilson, 1, Thurloe Place, Brompton Road, S.W. (general manager, United Motors, Ltd.); R. M. Emslie, 14, Panton Street, W. Solicitor: A. J. M. Duncan, 21, Leadenhall Street, E.C. Registered office: 14, Panton Street, Haymarket, W.

Scintilla, Ltd. (169,261).—Private company. Registered July 24th. Capital, £5,000 in £1 shares. To carry on the business of electrical, mechanical, and automobile engineers, manufacturers, importers, and contractors for the supply of, agents for, and dealers in, magnetos and ignition devices, starting equipments for internal combustion engines, lighting and other equipments, &c. The first directors are: G. Boveri, Switzerland (director, Brown, Boveri & Cie. Societe Anonyme of Baden, Switzerland); J. Schnyder, Solothurn, Switzerland (managing director, Scintilla Societe Anonyme of Solothurn); A. C. Eborall, 93, Old Queen Street, Westminster (director, Brown, Boveri & Co., Ltd., and Power Rectifiers, Ltd.). Solicitor: W. T. Holland, 65, Bishopsgate, E.C.

Cobalt Magnet Steel Co., Ltd. (169,265).—Private company. Registered July 26th. Capital, £500 in £1 shares. To carry on the business of melters and manufacturers of or dealers in magnet and other steel, engineers, rollers, manufacturers of files, tools, electric or other plant, founders and general contractors, &c. The subscribers are: C. G. Morton, 99, Burcot Road, Sheffield, manager; H. Priest, 48, Vincent Road, Sheffield, secretary. The first directors are not named. Solicitor: J. Barber, 29, Bank Street, Sheffield.

Kinetic Organ Blower Co., Ltd. (169,204).—Private company. Registered July 22nd. Capital, £500 in £1 shares. To take over the business of electrical and general engineers and manufacturers of and dealers in electric, water, and other engines, and apparatus for blowing organs, air compressors and exhausters, general importers, exporters, merchants, and commission agents lately carried on by the Kinetic Co., Ltd., at Lincoln, and to enter into an assignment with E. J. Jackson, J. H. Swanton, and J. Day, and the said company and T. Rimington, the liquidator thereof. The permanent directors are: W. Mobbs, 71, Portland Street, Lincoln; C. Rawding, 16, Ashfield Street, Lincoln; R. G. Chatfield, 96, Studdridge Street, Fulham, S.W.6. Qualification, 50 shares. Secretary: W. Mobbs. Registered office: Kinetic Works, Swanpool Court, Lincoln.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

National Electric Construction Co., Ltd. (53,364).—Return dated July 24th, 1919 (filed May 21st, 1920). Capital, £125,000 in 10s. shares; 170,000 taken up; £75,574 10s. paid; £9,425 10s. considered as paid. Mortgages and charges, £75,000.

African Direct Telegraph Co., Ltd. (21,895).—Return dated June 30th, 1920. Capital, £300,000 in £10 shares; 23,600 shares taken up; £236,000 paid. Mortgages and charges, nil.

Verity's, Ltd.—Satisfaction in full on July 16th, 1920, of mortgage dated June 26th, 1917, securing £3,850.

Switchgear & Cowans, Ltd.—Issue on July 19th, 1920, of £150 debentures, part of a series already registered.

Oxford Electric Co., Ltd.—Particulars of £50,000 debentures authorised May 28th, 1920. Amount of present issue £25,000. Property charged: the company's undertaking and property, present and future. No trustees.

R. J. Rodd, Ltd.—Deposit on July 1st, 1920, of deeds of properties in Walton-on-Thames and Surbiton to secure all moneys due or to become due from company to Barclay's Bank, Ltd.

Folkestone Electricity Supply Co., Ltd. (51,825).—Return dated May 14th, 1920. Capital, £100,000 in £5 shares. All shares taken up. £100,000 paid. Mortgages and charges, £94,080.

Barraclough Brothers, Ltd.—Agreement dated June 24th, 1920, to secure £1,486 19s. 10d. charged on certain moneys and three electric motors. Holders: W. H. Spencer & Co., Ltd., Bowling Dyke Mills, Halifax.

Hongkong Tramway Co., Ltd. (75,486).—Return dated April 28th, 1920. Capital, £81,250 in 5s. shares. All shares taken up and considered as fully paid. Mortgages and charges: $700,000 = £170,625.

Henley's (South Africa) Telegraph Works Co., Ltd. (77,781).—Return dated April 9th, 1920. Capital, £2,000 in £1 shares. All shares taken up and paid for in full. Mortgages and charges: nil.

Ebonestos Insulators, Ltd.—Legal Mortgage dated June 30th, 1920, to secure all moneys due or to become due from company to Barclay's Bank, Ltd., charged on Excelsior Wharf, Rollin Street, Deptford.

CITY NOTES.

British Thomson-Houston Co., Ltd.

Mr. H. C. Levis presided at the annual meeting held at the offices, 83, Cannon Street, E.C., on July 27th. He said that at the last annual meeting he stated that the directors were considering the question of new capital required by the constant growth of the company's business, and higher manufacturing costs, and that proposals relative thereto would in due course be laid before the shareholders for consideration. The share capital had been comparatively small, consisting of £400,000 in 4 per cent. cumulative preference shares, and £400,000 in ordinary shares. The floating debt, mainly due to the General Electric Co. of New York—and afterwards to the International General Electric Co. of New York—had been large. No dividends had been paid on the preference shares for a number of years, as the directors, after consultation with the holders of a large majority of these shares, considered it best to conserve their resources for the expansion of the company's business. Under the articles of association, any holder of preference shares had the right to require that his holding should be converted into ordinary shares, and if the holders of a certain percentage should so require, then the company could declare all of the remaining outstanding preference shares to be ordinary, so that the conversion should be complete. Recently the necessary percentage made a formal request to the company to make this conversion, and this had been carried into effect, consequently the company had now no preference shares outstanding, but only an issue of £800,000 ordinary shares. At an extraordinary general meeting the necessary resolutions were passed by which each of the £10 shares was divided into ten £1 shares, and the ordinary shares were increased to £2,000,000, consisting of £2,000,000 shares of the denomination of £1 each. The necessary resolutions were also passed creating 2,000,000 preference shares, of the denomination of £1 each, bearing cumulative dividends at the rate of 7 per cent. per annum. These resolutions had been ratified, so the authorised capital of the company at this time consisted of £2,000,000 in ordinary shares, and £2,000,000 in 7 per cent. preference shares—all of the denomination of £1 each. Subject to confirmation at that meeting, it was proposed to issue to the holders of the old preference shares, in full payment of all accumulated dividends and free of further income tax, ordinary shares of the par value of five guineas for each £10 preference share held. Also to issue £40,000 par value of these ordinary shares as a dividend at the rate of 10 per cent., free of further income tax, to the holders of the old ordinary shares. These dividends—payable out of the reserve account—would absorb £250,000 of ordinary shares. The remaining ordinary shares and all the preference shares would be issued from time to time as might be necessary for the requirements of the company. Their debt to the International General Electric Co. Inc.—payable in dollars—had been settled by advances in sterling from the bankers. This involved a loss in exchange, which was dealt with in the last year's accounts. The amount due to their bankers would be liquidated in due course by the proceeds of their share issue. During the year they expended on additions to factories at Rugby, Coventry, and Willesden £184,660, and wrote off £59,660, leaving the net book value at £950,000, which, having in mind their cost, was a very conservative figure. In September they entered into an agreement to purchase some factory buildings and land at Blackheath, near Birmingham. Due to various difficulties that arose in connection with titles, they were unable to take possession until June this year. The floor space at present available in the buildings acquired was about 250,000 sq. ft., and the area of the land was over 70 acres. Manufacturing operations would commence as soon as possible. Plans were in hand for further extensions at these works. Considerable additions were being made to the factory at Rugby, which would greatly accelerate and increase the output of turbines, large motors and generators, and incandescent lamps. Negotiations had been completed for a considerable area of land in another part of the country, where it was proposed, among other things, to erect a lamp factory, as the facilities at Rugby for the manufacture of lamps could not advantageously be extended much beyond their present limits. Turning to the profit and loss statement, it would be observed that the profits for the year, after deducting all expenses and charges, other than interest on debentures and loans, and after making provision for estimated war taxation for 1919, were £412,399, which he thought might be considered very satisfactory, particularly as the ascertained loss in exchange to December 31st had been deducted. In view of the fact that the accumulated dividends on the old preference shares would be paid up by the issue of new ordinary shares, and that the old ordinary shares were now receiving a dividend of 10 per cent.—likewise payable in new ordinary shares—they had not recommended to the shareholders that any further distribution be made at present. It was hoped that the company would next year resume the payment of dividends on a satisfactory basis. The large electric steel rolling mill equipments to which he referred last year had now been in commercial operation for several months, and their performance had been in every way up to their expectations, and had given entire satisfaction to the purchasers. These were among the largest equipments for this class of work which had ever been built. Last year he stated that, judging from the inquiries which they received after the signing of the armistice, there was an enormous amount of business in sight; the volume of orders placed with them since then, justified this statement. The orders received for the first six months of this year were larger than those for the corresponding period of 1919, though 1919 was a record year, and the volume of orders on hand was the largest in the history of the company. One of the greatest hindrances to their output had been the shortage of castings occasioned by the moulders' strike, the latter part of last year. All branches of engineering had been, and were still, embarrassed by this shortage, and it seemed almost impossible to make up for the time lost. It had seriously interfered with their output, in spite of the great efforts they had made to overcome the difficulty. They had made a contract with the International General Electric Co. Inc., of New York, which took the place of the one previously existing between the General Electric Co., of New York, and themselves. This substantially increased the possibilities of the company's business, and was a very valuable asset, having in mind the fact that it conferred on them for their territory the patent rights of all the inventions of the General Electric Co., of New York, as well as the benefit of its research laboratories, which were undoubtedly the leading electrical research laboratories in the world to-day. So that they might keep in close contact with business on the Continent of Europe, they had taken a financial interest in the Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston, and the Société d'Electricité et de Mecanique (Procédés Thomson-Houston et Carels), of Belgium, and several of the directors were on the boards of these two companies. This was an important connection, and they expected it would be of material benefit to the company in various directions. He did not think it was fully realised how much was done by many manufacturing companies for the benefit of their employés. Most companies gave a good deal of attention to such matters, and their company was no exception to the rule. They had established canteens on a large scale, where good food was supplied at very reasonable prices, and under attractive conditions. At Rugby they had purchased a large tract of land, which would be devoted to sports and recreation, and it was their intention in due course to provide similar facilities at other points where they had manufacturing establishments.

They also encouraged and assisted various movements, such as welfare clubs, boy scouts, bands, &c., and particular attention was given to education. Their booklet giving particulars of the company's educational arrangements had attracted much favourable comment, not only here but also abroad. The company had recently established two scholarships, under which two young men would be sent every year to America, free of expense, for a year's training in engineering, manufacturing, and commercial work. It was felt that not only would this be a valuable experience to young men who they expected would remain in the service of the company, but that it would also be a factor—even though small—in maintaining and developing good relationship between the two countries. One of the serious difficulties confronting a great many companies to-day was the excess profits duty, which was unfair both in theory and in practice, in that it penalised most those who were the most progressive. If two companies were making the same amount of profit, and one happened to have a good pre-war standard, that one had little or no excess profit duty, whereas the other, whose business had increased, had to pay heavily. It was equitable that those companies whose business increased *during the war* should not profit unduly during that period by reason of such increase, but the business which was being done to-day had nothing to do with the war, and should not be subject to these special war conditions. The only fair tax was one that applied equally to all. It was particularly hard on a progressive company, because progress in itself involved the tying up of capital, while this unfair tax absorbed the greater part of the return from that capital, and thereby actually chilled the incentive to progress. Consequently, when new capital was required, it was difficult to obtain it under such conditions. During the year, notwithstanding the many difficulties which had been encountered, the members of the staff had worked hard and loyally. They had done all they could to reinstate ex-service men.

Lord Carmichael seconded the motion, which was carried unanimously.

German Companies.

The directors of the *Elektra A.G., of Dresden*, which is interested in a number of supply works and tramways, state that most of these undertakings yielded better results in 1919 than in the previous year. After having made provision for depreciation, the accounts show net profits of 288,000 marks, and permit of the payment of a dividend at the rate of 5 per cent., whereas a loss was incurred in 1918, which was covered out of the reserve fund.

The *Einkaufs Vereinigung fur Elektrotechnische Bedarfs Artikel* (Buying Association for Electrical Requirements), *of Frankfort-on-Main*, which reports an increase in the membership from 318 in 1918 to 432 last year, earned net profits of 98,000 marks in 1919 as compared with 46,000 marks in the preceding year. The dividend is at the rate of 8 per cent. for 1919, and it is mentioned that the value of the turnover at 28,860,000 marks was about twice that in 1918.

The *Continentale Ges. fur Elektrische Unternehmungen of Nuremberg*, reporting on the company's investments for 1919, states that it was possible for the electricity works, by increasing prices, gradually to recover from the reaction, but the railways and tramways showed varying results. It was impossible to predict the development of the undertakings in the near future owing to the general uncertainty. The net profits increased from 1,272,000 marks in 1918 to 1,384,000 marks last year, and the dividend on the preference shares, which compose most of the share capital, is at the rate of 3 per cent., as in 1918.

The report of the *Accumulatoren Fabrik A.G., of Berlin and Hagen*, states that the disposition to place new orders in 1919 decreased in accordance with the advance in sale prices, and the output of the works consequently declined as compared with the previous year. On the other hand, an increase in the number of workers and officials took place owing to the reduction in the working shift and the lower average efficiency of the men. The provision made for depreciation was 444,000 marks, as against 411,000 marks, and the net profits were 2,525,000 marks as contrasted with 2,993,000 marks in 1918, permitting of the payment of a dividend at the rate of 17 per cent. for 1919, as compared with 20 per cent. in the previous year.

The report of *Brown, Boveri & Co., A.G., of Mannheim*, covers a period of nine months as a result of the transfer of the financial year to the calendar year. The directors state that owing to the scarcity of raw material the production of manufactures was again only a fraction of that in former peace periods; estimates were impossible, and fixed prices and binding periods for delivery to customers could not be given. If, nevertheless, satisfactory results were achieved, these were due to the market's extraordinary capacity for absorption. The sale of electric motors for agricultural purposes was extremely active, but the department for large machines was not well employed. The construction of steam locomotives was in full progress, while satisfactory results were obtained in the new branch for the production of special articles for installations. After writing off 1,327,000 marks for depreciation in the nine months ended with December, as against 702,000 marks and 2,298,000 marks for war expenses in 1918-19, the accounts show net profits of 834,000 marks, as compared with 827,000 marks. It is proposed to pay a dividend at the rate of 6 per cent., as in 1918-19, on share capital of 9,000,000 marks, which has since been increased to 15,000,000 marks.

Yorkshire Electric Power Co.—The directors report satisfactory progress during the half-year ended June. The costs of coal, labour, and materials have been higher, but owing to production on a larger scale the profit earned on the larger capital employed has been more than proportionately increased. After payment of bank and other interest, the net profits for the three half-years ending June 30th were: 1918, £23,683; 1919, £19,229; 1920, £30,146. In view of the strengthened financial position of the company the board have decided upon the payment of an interim dividend on the ordinary shares at the rate of 3 per cent. for the half-year. New contracts have been made to supply large additional amounts of power which will bring a further increase of revenue. Additional plant and mains have been ordered to meet these further demands. The recent issue of £230,000 debentures and £400,000 of ordinary stock has enabled the finances to be regulated and the loans from the Government and from the bankers to be repaid. "An inquiry has been announced by the Electricity Commissioners as to the present and future position of electricity supply in the northern portion of the company's area, and will be held at a date to be announced by the Commissioners. The board will be prepared to co-operate in any satisfactory scheme that will be to the advantage of the area."

Stock Exchange Notices.—Application has been made to the Committee to allow the undermentioned to be officially quoted:—

General Electric Co., Ltd.—1,600,000 seven and a-half per cent. "B" cumulative preference shares of £1 each, fully paid, Nos. 1 to 1,600,000.

The Committee has specially allowed dealings in the following under temporary regulations 4 (3):—

Calcutta Electric Supply Corporation.—£500,000 5 per cent. first mortgage convertible (registered) debentures (free of income-tax), issued at 95 per cent., of which 15 per cent. is paid.

Vickers.—£1,500,000 seven per cent. seven-year notes, issued at 95 per cent., scrip, 15 per cent. paid.

Bullers.—250,000 first mortgage 6 per cent., free of income tax, redeemable debentures of £50 and £100 each (registered) after issue of letters of acceptance.

Durelco, Ltd.—55,095 shares of £1 each, 12s. 6d. paid, Nos. 1 to 55,095.

Telephone Manufacturing Co. (1920).—100,000 ordinary shares of £1 each, fully paid, Nos. 1 to 7, and 310,008 to 410,000, after issue of allotment letters.

The Committee has ordered the undermentioned to be officially quoted:—

Chili Telephone Co., Ltd.—11,000 shares of £5 each, fully paid (Nos. 88,001 to 99,000).

English Electric Co., Ltd.—1,431,509 ordinary shares of £1 each, fully paid (Nos. 1 to 1,431,509), and 698,564 6 per cent. cumulative preference shares of £1 each, fully paid (Nos. 1 to 698,564), and £1,000,000 5½ per cent. sinking fund first mortgage debentures (Nos. 1 to 10,000) (bearer).

Stewarts & Lloyds, Ltd.—850,000 deferred shares of £1 each, 5s. paid (Nos. 850,001 to 1,700,000).

The German Transmarine Electricity Co.—The Compania Hispano-Americana de Electricidad of Madrid is the title of the company formed to take over the assets of the Deutsch-Ueberseeische Gesellschaft of Berlin, whose undertakings are situated in Buenos Ayres and other South American cities. The promoters of the former are the Banco Central, the Banco Urquijo of Madrid, the Banco de Vizcaya of Bilbao, the Banco de Barcelona and the Sociedad Arnus Gari of Barcelona. Particulars of the financial details of the transaction have previously been published. It only remains to mention that the Spanish company is redeeming the loans and preference shares in the German company, while 91 per cent. of the ordinary shares has already been exchanged for certificates in the Spanish company pending the final settlement. At the same time the transaction has afforded the Electric Light and Power Investment Co. of Berlin, as a large shareholder in the Transmarine Company, an opportunity for coming to an arrangement with its Swiss holders of a loan of 10,000,000 fr. under which the latter is paid off partly in interest bonds and shares in the Spanish company and partly in new shares of the German company.

Tokio Electrical Companies.—The Tokio Electric Co. held a semi-annual meeting of shareholders at Tokio on June 22nd, when a dividend of 20 per cent. per annum was declared. The company's net profit for the six months amounted to 1,087,000 yen. The Tokio Gas and Electric Engineering Co. at its semi-annual meeting on June 30th was to declare a dividend of 20 per cent. per annum. The net profit for the six months amounted to 1,963,526 yen, against 1,452,647 yen for the previous six months.—*Reuter's Trade Service.*

The Great Northern Telegraph Co., Ltd., of Denmark.—The proposal to distribute a dividend and bonus of 22 per cent. for 1919 (inclusive of 5 per cent. already paid) was duly passed at the general meeting held at Copenhagen on 31st ult. The final dividend and bonus for 1919—34s. per £10 share—is now payable at Messrs. C. J. Hambro & Son, 70, Old Broad Street, E.C., against Coupon No. 21.

Australia.—The Electric Light & Power Supply Corp., Ltd., Balmain, intends increasing its nominal capital to £500,000, and the sanction of shareholders was to be sought at the yearly meeting in June. The additional capital is required to provide further generating plant, enlargement of power house, erection of overhead bunkers, extension of trunk mains, and substations.—*Tenders.*

National Gas Engine Co., Ltd.—Interim dividends of 5 per cent. per annum, less tax, on the preference shares, and 7½ per cent. per annum, less tax, on the ordinary, for the June half-year.

Bristol Tramways and Carriage Co., Ltd.—Interim dividend for the half-year ended June at the rate of 3 per cent., free of income tax, on the ordinary shares.

Charing Cross, West End & City Electricity Supply Co., Ltd.—Interim dividend on the ordinary shares of the West End undertakings for the half-year ended June at the rate of 2s. 6d. per share.

Brightside Foundry & Engineering Co., Ltd.—Accounts not yet completed, but the results admit of a dividend of 10 per cent., free of tax.

Westminster Electric Supply Corporation, Ltd.—Interim dividend at the rate of 8 per cent. per annum, less tax, for the half-year ended June.

City of Buenos Ayres Tramways Co., Ltd.—Dividend of 1s. 3d. per share (5 per cent. per annum), less tax, for the quarter ended June.

North London Railway Co.—Interim dividend of £2 10s. per cent. for the half-year ended June 30th last on the Consolidated ordinary stock, an increase of ¼ per cent.

Electrical Distribution of Yorkshire, Ltd.—Interim dividend on the ordinary shares at the rate of 6 per cent. per annum, free of tax, for the June half-year.

Hong Kong Tramway Co., Ltd.—Interim dividend of 9d. per share, less tax, for the half-year.

STOCKS AND SHARES.

TUESDAY EVENING.

MARKETS in the Stock Exchange are characterised by a fair amount of firmness. In some departments there is even business doing. The Bank Holiday weather is said to have determined some men to cut short, or postpone their holidays, and thus to account for an unexpected degree of interest being taken in certain markets. The pessimist points out that on the Tuesday following any Bank Holiday there is an accumulation of work generally awaiting attention, and that it is not just to credit the weeping weather with being a support to the Stock Exchange.

From whatever cause it proceeds, however, the interest in market matters is welcome enough in what ought to be these sultry days. The agitation against fare-raising on the railways has already died down. Some there are who think the farthing increase will not make a vast amount of difference after all. On the Tube lines, any permission to raise the fares would certainly have a pronounced effect upon receipts. The Central London has just opened its new branch to Ealing. Side by side with the announcement of this, the company is advertising that it paid ¼ per cent. dividend on the undivided ordinary stock for the last six months, and carried 25½ million passengers to do it. However, in hope of better things, Underground incomes are again 1 higher, the £10 shares have gained 5s., and 'Bus "A" strengthened to 5s. 6d. London Electric Railway debenture stock at 53½ is lower.

One of the features of the moment is the way in which dollar securities are rising. Substantial advances have been secured this week by Montreal Light and Power at 265, Shawinigan common shares 127½, General Electric of New York fives 115, Canadian General Electrics 116½ and preferred 112½, American Telephone and Telegraphs 124. The reason lies, of course, in the way that the New York exchange is moving—a matter which gives rise to concern amongst those who foresee the possibility of the pound sterling becoming worse—in relation to the dollar—before it improves.

The condition of other foreign affairs does little to encourage enterprise in most securities abroad. There is a touch of exasperation in the comments on Mexico, for revolution seems to have broken out again as usual, and there is no peace for holders of Mexican stocks. So prices are much as they were, with a point rise in Mexico Tramways first mortgage bonds to add "contrariness" to the position. With Brazilians, the uncertainty is due more to Paris than to Rio, because recently the French financial atmosphere has been very uncertain, and Brazilian Tractions, held largely in France and Belgium, have come to market rather freely. A rise in the milreis more than checked the fall, and the price is ½ higher on the week. The Argentine Republic already notices the effect of its Government's edict upon unrestricted grain exports, traffic decreases taking the place of previously expanding revenue. So Argentines are dull for choice, as the Stock Exchange has it.

When so much is being said and written about E.P.D. and the Corporation tax, it is a little surprising that greater attention is not paid to the fact that electricity supply companies stand amongst those which escape the Corporation tax altogether. Publicity has been given to the fact, it is true, but many people do not realise it, all the same, as any stockbroker knows whose business leads him into this particular field for investment. Electricity supply shares continue as lifeless as ever. St. James and Pall Mall, quoted ex dividend, have joined the ranks of ordinary shares in this market from which the investor can draw, at to-day's prices, 9 per cent. or more on his money.

Manufacturing shares are quiet, with a dullish disposition. Babcock & Wilcox have gone back to 50s., Edisons to 22s. 6d., and General Electrics to 30s. The new ordinary shares of the last-named stand at 28s. 6d., and the 7½ per cent. B preference at 19s. 7½d. Telegraph Constructions changed hands the other day at 19¾. Marconis are 1-16 lower at 58s. 9d. Technical difficulties have arisen in connection with the starting of a market in Radio Corporation shares—the old American Marconis. It appears that some of the certificates carry voting rights, and that others do not. The Stock Exchange Committee seem to be rather nonplussed as to which class they shall grant the necessary permission to deal in. Outsiders might ask: "Why not in both classes?

Eastern Telegraph ordinary is harder, and Globe ordinary again rose 5s. United River Plates are ½ down. The various new issues of the Eastern group are very well maintained. Armaments lean slightly to the heavy side. The rubber market is a trifle undecided, because Americans are selling, instead of buying, the raw product, and this keeps the price down.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price Aug. 3, 1920.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	8	12	62	—	£9 8 2
Charing Cross Ordinary	4	7	8½	—	10 0 0
do. do. do 4½ Pref.	4½	4½	52	—	8 8 8
Chelsea	3	4	50	—	8 0 0
City of London	8	10	15	—	6 17 10
do. do. 6 per cent. Pref.	6	6	17/6	—	6 17 2
County of London	7	8	8	—	10 0 0
do do. 6 per cent. Pref.	6	6	82	—	7 5 5
Kensington Ordinary	6	7	4	—	8 15 0
London Electric	Nil	2½	1½	—	6 0 0
do. do. 6 per cent. Pref.	6	6	8	—	10 0 0
Metropolitan	5	6	25	—	10 8 8
do. 4½ per cent. Pref.	4½	4½	21?	—	8 0 0
St. James' and Pall Mall	10	12	66xd	—	9 1 2
South London	5	6	2½	—	9 12 0
South Metropolitan Pref.	7	7	18/9	—	7 0 0
Westminster Ordinary	8	10	5½	—	9 15 2
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	79½	—	7 11 0
do. Def.	83/6	1½	17½	—	8 11 5
Chile Telephone	8	6	fxd	—	*5 0 0
Cuba Sub. Ord.	7	7	84	—	*8 4 8
Eastern Extension	8	10	144	—	*6 18 0
Eastern Tel. Ord.	8	10	1·7½	+1	*6 15 6
Globe Tel. and T. Ord.	8	10	15	+ ½	*5 13 4
do. do. Pref.	6	6	84	—	7 1 2
Great Northern Tel.	22	22	214	—	10 4 8
Indo-European	18	10	80	—	8 8 8
Marconi	25	25	2½	— 1/8	8 10 0
Oriental Telephone Ord.	10	12	2½	— ½	*4 16 0
United R. Plate Tel.	8	8	6¾	— ½	*5 16 4
West India and Panama	1/3	Nil	⅛	—	Nil
Western Telegraph	8	10	15	—	*6 13 4
HOME RAILS.					
Central London Ord. Assented	4	4	44½	—	8 19 9
Metropolitan	1	1½	19¼xd	—	6 8 9
do. District	Nil	Nil	15	— ½	Nil
Underground Electric Ordinary	Nil	Nil	1½	+ ½	Nil
do. do. "A"	Nil	Nil	5/6	+6d.	Nil
do. do. Income	5	4	57½	+1	—
FOREIGN TRAMS, &c.					
Anglo-Arg. Trams. First Pref.	Nil	5½	8½	—	8 9 2
do. do. 2nd Pref.	Nil	Nil	5½	—	Nil
do. do. 5 Deb.	5	5	56½	—	8 11 0
Brazil Tractions	Nil	Nil	48	+ ½	Nil
Bombay Electric Pref.	6	6	13	—	4 10 0
British Columbia Elec. Ry. Ptcs.	5	5	66½	—	8 17 0
do. do. Preferrred	2½	5	53½	— 1	9 10 6
do. do. Deferred	Nil	5	53½	— 1	5 12 2
do. do. Deb.	4½	4½	65	—	7 14 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	30	—	Nil
do. 6 per cent. Bonds	Nil	Nil	29	—	Nil
Mexican Light Common	Nil	Nil	14	—	Nil
do. Pref.	Nil	Nil	25½	—	Nil
do. 1st Bonds	Nil	Nil	49	+1	Nil
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	2½	— ½	*5 0 0
British Aluminium Ord.	10	10	1·7½	—	9 8 2
British Insulated Ord.	12½	15	1½	—	8 5 6
Callenders	25	15	1·7½	—	11 8 6
,, 6½ Pref.	6½	6½	18/-	—	7 4 5
Castner-Kellner	20	17	3	—	5 13 4
Crompton Ord.	10	10	19/6	—	10 5 2
Edison-Swan, "A"	10	10	1½	— 1/16	8 17 10
do. do. 5 per cent. Deb.	5	5	75½	—	6 5 9
Electric Construction	10	10	1	—	10 0 0
Gen. Elec. Pref.	6½	6½	18/6	—	7 0 5
do. Ord.	10	10	30/-	— 6d.	*6 13 4
Henley	25	15	1½	—	8 0 0
do. 4½ Pref.	4½	4½	8½	—	6 18 6
India-Rubber	10	10	25/9	—	*7 15 4
Met.-Vickers Pref.	—	8	2·2	—	7 6 2
Siemens Ord.	10	10	28/6	—	*7 17 0
Telegraph Con.	20	20	50½xd	—	*5 17 0

* Dividends paid free of Income Tax.

NOTES ON TRADE-MARKS.

By THEODORE RICH, O.B.E.

In the early days of civilisation only a very small proportion of the community could read, and therefore traders and other individuals used marks or signs to denote their shops, businesses or the families to which they belonged. When the industrial revolution took place and goods began to be manufactured in bulk by machinery, business men found it desirable to distinguish the goods they manufactured or supplied by particular marks, to keep up the quality of the goods and make it possible for satisfied purchasers to ask for the same make of goods again, even if they could not read or understand the language spoken in the country of production.

About 100 years ago the law began to recognise the proprietory rights in trade-marks, and experience showed that dishonest traders frequently copied the marks in order to foist inferior or imitation goods on to the market. In 1838 Lord Cottenham decided that an injunction could be obtained to restrain infringement of a trade-mark, even in cases where it was due to ignorance and done without fraudulent intent.

In the early days the essence of the mark was the association of the goods with some particular maker or trader, and therefore in order to prosecute an infringer, it was necessary to prove that a certain mark was known by the general public as being associated with a certain firm. The difficulty of preventing infringement was enhanced by the fact that many of the infringers were men of straw. The Merchandise Marks Act of 1862 was mainly connected with the criminal side of law, but it facilitated the protection of the owner of a mark from infringements, and after much controversy, the registration of marks was started. The Trade-Marks Registration Act of 1875 put the question of trade-marks on a new and firmer basis, and subsequent legislation has been mainly built up from this Act. The Act made registration *primâ facie* evidence of the right of the registered proprietor to the exclusive use of his own trade-mark for the class of goods specified by him.

The earlier marks were very largely composed of well-known objects such as a horse, a dog, or some tool or implement, and it must be obvious that it soon became almost impossible for a trader to use such an object for all classes of goods, and claim a monopoly for its use, in fact in recent years it is usually difficult to find a striking object usable as a mark which has not been appropriated to one or more classes of goods.

The law of trade-marks was to a certain extent codified in 1905, and slightly modified in 1919, to make it more elastic. The modern mark is the creation of statute, and unless a mark was in use before 1875, it is impossible to take action for infringement unless it has been registered, and the necessary fees paid. It must be said, however, that even if the mark is not registered, or cannot be registered, it is possible to get a certain equivalent of mark protection by an action for passing off goods got up with the assistance of marks in order to deceive the public.

At present under the 1905 Act as recently modified, a person claiming to be the proprietor of a mark who wishes to register must apply in writing to the Registrar, who may refuse to accept it, or may accept subject to modifications or conditions, and, if required, the Registrar must state the grounds of his decisions which can be the subject of an appeal to the Board of Trade or the Court. After application, an official search is made, and if no objections are raised on legal or practical points, or on the ground of previous use or similarity to existing marks, the mark is advertised, and time is given for anyone to raise objections either on the grounds of infringement of rights, or other grounds. Those who oppose the granting of the mark, and who are dissatisfied with the decision of the Registrar, can appeal to the court. The 1919 Act makes registration after seven years after the passing of the Act, or after seven years from the registration, practically conclusive of validity.

It must be pointed out that existing legislation does not require "user" before registration, and it is open to a manufacturer, trader, or even a designer, to design some device, and to get it registered, provided it complies with certain conditions. It should be noted that when an article has been introduced and manufactured under a patent, the name of the article becomes common property, and it becomes descriptive of the article itself, and not of the maker, and the restrictive rights to use such name expires with the patent.

In order to obtain registration, the following are the conditions in the 1905 Act, as modified by the 1919 Act. The mark must contain one or more of the following particulars at least:—

1. "The name of a company, individual, or firm represented in a particular manner." This means that some particular printing scroll or other device must be used, and the name as such must not be used without some peculiarities.

2. "The signature of the applicant or his predecessor."

3. "An invented word or invented words." The 1883 Act mentioned "Fancy" words, but this expression gave rise to much difficulty, and its use has been abandoned. At present an "invented word" can, to a limited extent, refer to the quality or character of the goods. It is necessary for the invented word to be "coined" for the purpose of being applied to the goods in question, and it must not be merely one or two words joined together and jumbled up or misspelt; in general, a foreign word, although not one generally known or understood in the United Kingdom, cannot be registered.

4. "A word, or words, having no direct reference to the character or quality of the goods, and not being according to its ordinary signification a geographical name or surname." The objection which there is to the use of a mark of matter descriptive of the goods in question is to prevent one firm having a monopoly in the use of certain laudatory or other terms. It would, for example, seem unfair to register "First Class" or "Best Quality" as trade-marks for some make of boots, workshop tools or appliances, when another maker might say that his goods were also of the same character; and where a geographical name is that of a place where the goods are manufactured, or specially sold or handled, it would be unfair to prevent others carrying on business at the same place from using the same geographical name for their goods. Place-name trade-marks have been allowed in some special cases.

The earlier statutory trade-marks were limited to those coming under the above categories, Nos. 1 to 4, but as a number of well-known marks were being shut out from registration, a clause was added in the 1905 Act enabling any other distinctive mark to be registered, subject originally to the sanction of the Board of Trade or the Court; this has again been somewhat modified, allowing a "distinctive mark adapted to distinguish the goods of the proprietor of the trade-mark from those of other persons." In order to register under this section, evidence of use is an important factor.

The recent case of the National Galvanisers, Ltd., is of interest. The company manufactured metal hollow-ware goods in the United Kingdom, and wished to register the word "National" as a mark in respect of goods of this class. The Wrought Hollow-Ware Trade Employers' Association opposed the application, stating that such a mark would make the public think that the goods were produced under public auspices and for the public benefit, and that such a mark would interfere with the business of competitors; and that to allow such a mark would be against public policy. The Comptroller-General exercised his discretion and refused the application, and the applicants appealed to the Court.

It was submitted in support of the appeal that the mark contained "no direct reference to the character or quality of the goods," and also that the word "National" had been registered after appeal in connection with cash registers. It was submitted on behalf of the respondents that in the

National Cash Register case "user" had been shown for 80 years, and that the goods were known to be of American make, whereas in the case of this company five years' use only could be shown, and there was a danger that the word National might be thought equivalent to British; further, as regards earlier registrations of the word National opposition had been absent.

Mr. Justice Astbury, in his judgment, held that the two cases where the word "National" was in question, were distinguishable. In the Cash Register Case there had been no trade opposition, although the use of the word had been objected to by the Registrar as undesirable.

In that case the opposition was unfortunate, as on the appeal it had been proved that a secondary meaning had become attached to a word which was in itself undesirable; the judge agreed with the judgment in that case, but in this case the facts were the opposite. The Comptroller-General had in this case exercised his discretion and had quite correctly refused the application.

As a general rule, word trade-marks, apart from distinctive devices, are not favoured by the Registrar, and when there is trade opposition and an appeal to the Court, the applications are not often successful. The Court will not protect a trade-mark which gives a false description of the article in question, and it is no answer that the trade or any other class of persons are aware of the actual facts and are not deceived by it. It is to be regretted that the Companies' Registrar has not, apart from similarity of titles, the same discretionary powers to check the registration of companies with names of a deliberately deceptive character.

The number of marks used in the electrical trade is not large, and their use, as might be expected, is largely confined to lamps, fittings and cable, although with regard to the last of these, where the quality depends mainly on the mixture used, protection by a trade-mark or some distinctive label is a matter of considerable importance.

TRUSTIFICATION OF GERMAN INDUSTRIES.

Indications that have appeared in the German Press from time to time foreshadow a gigantic trustification of all German industries. The scheme outlined, which is due to Von Moellendorf and other officials of the German Ministry of Industry, is offered as a counterblast to socialisation, to which capitalists are averse, and which even the workmen themselves agree would not be in their best interests.

The new scheme is termed by its originators "combined-plan industry," or "combined-plan economy," and is intended to include, sooner or later, all industries. Each industry will be grouped under one organisation, in which the capitalist, the worker, and the consumer (through the merchant), will be represented. Each organisation will fix its own prices, control raw material supplies, control exports, stimulate production—in a word, exercise supreme authority in all matters connected with the development of the particular industry whose interests it represents. The whole of these organisations will ultimately be subjected to the control of a super-trust, controlled by the Ministry of Industry.

A start has already been made in the iron and steel industries, as the firms hitherto belonging to the Steel Works Trust are joining the new organisation. Different departments of the organisation will have their own sub-organisations, and the whole will be under the control of a Steel and Iron Parliament, with representatives of Capital, Labour, and the Government. The coal and potash industries will also shortly be organised in the same way.

As regards the electrical industry, no particulars are yet available. The Government has, however, taken the first step in passing a law authorising it to take over certain electricity stations, utilise water power on a large scale, and run these in the way best calculated to benefit the community.

All firms will subsequently be compelled to join the particular organisation connected with their industry, and heavy penalties are to be provided for in the case of any infringement of the regulations laid down by the organisation.

The object of this vast scheme is to secure the best utilisation of the material resources of the country, with a view to re-establishing the industries on a sound footing. Considerable opposition has always been offered since the signing of the armistice to the "compulsory economy" or Government control of industry; while, on the other hand, as stated above, Labour aspirations have been in the direction of securing more adequate representation in the development of all industries.

In connection with the above organisation, the Workers' Council Bill was made law some time ago, and will, it is thought, go a long way to secure the objects aimed at by the Government. Under this new law, every works employing at least 20 workpeople is bound to form a Works Council, on which Labour will be represented in proportion to its numbers. A similar organisation will be formed by the capitalist, and by the terms of the Act, the two bodies, representing Capital and Labour respectively, are bound to discuss matters of interest to both of them. Capital is pledged to secure the best conditions of working, while Labour must undertake to advise and co-operate in carrying out rules, regulations, &c., drawn up. Welfare work, housing problems, internal factory conditions, in addition to wages questions, come within the scope of the Councils. Disputes are to be settled at a Joint Regional Committee of Employers and Employed; or, in the event of no settlement being reached there, the Industrial Committee of the Government will have the final say.

Industrial experts and economists are doubtful of the success of the proposed scheme; but they agree that it affords a better solution than socialisation, because it will give the worker a certain amount of responsibility, while sufficiently safeguarding the employer.—E.S.H.

MOTOR STARTING AND CONTROLLING GEAR: SOME CRITICISMS AND SUGGESTIONS.

By G. T. DICKSON.

The ever-increasing tendency which large industrial firms are exhibiting towards the adoption of the independent electrical drive for machine units of all types has been the means of introducing many problems for the designer of motor starting and controlling gear.

The natural result is that this particular branch of the electrical industry is receiving far more attention than was formerly the case, and in addition to the numerous firms which specialise in motor starting and controlling apparatus, there are, of course, many large concerns where motors and starters, &c., are made and tested side by side.

It is, however, a regrettable fact that, in spite of the marvels which exist in the way of automatic gear, there is still room for a great deal of improvement in the design *and* manufacture of the majority of the various types of motor-starting and kindred apparatus at present being turned out. Indeed, it would seem that the old idea, that starters and controllers were but necessary evils, is yet lingering, and is going to die very hard. In support of this contention it would be easy to cite many instances in which large machines, turning out vitally important work, have been held up for several hours owing to the failure of a flimsy starting switch, and any plant engineer will say that he experiences far more trouble with his starters and controllers than he does with the motors which they are supposed to control.

It is, therefore, proposed to enumerate as briefly as possible, in the following article, some of the more outstanding faults which are to be found in almost all the existing types of controllers and starters, faults which the writer has had good reason to note in the course of a fairly wide experience in industrial electrical work.

Let us first consider the ordinary motor starter, fitted with the usual overload and no-volt releases. There are many variations in the design of this kind of starter, but almost all of them exhibit the same faults when in use. We will assume that we are dealing with a 2-H.P., 220 volt, D.C. starter of the type just referred to.

Common to all designs we have the two coils which act, as it were, as a safety valve for the motor; a movable switch arm; and the contact studs.

Now, presumably, it is the function of the no-volt coil to hold the switch arm in the "full on" position just so long as the motor is intended to run and no longer. Immediately an overload comes on the motor, or as soon as the main switch is opened, the de-energised coil should allow the arm to fly back to the "off" position. In how many instances, however, does the residual magnetism in the iron core of the coil more than suffice to retain the arm "hard over" long after the overload has done its worst? or, assuming that the motor was switched off at the main, the arm will be in a very suitable position for fuse testing and other firework displays.

It is true that this residual magnetism is generally counteracted either by drilling the cheek of the coil frame and inserting a brass peg, or by knocking one of the cheeks over until an air gap is obtained, but in a very short time the peg will wear away, or should the second method be used the magnet frame will become loose and self-aligning. The trouble is, of course, caused by the hardness of the iron core, which, again, is due either to the fact that the easting was "chilled" or that the wrong kind of iron was used. It is naturally assumed that the coil has been correctly wound.

Turning to the overload release, in the majority of types this is calibrated (save the mark!) to operate on a 25 per cent., 50 per cent., and 100 per cent. overload. Are these calibrations accurate? In nine cases out of ten they are not. This is not to be wondered at when it is considered that starter testing is generally the work of raw apprentices, or at best, semi-skilled improvers, who care little about the accuracy of their work. Very often you will find calibration marks nearly 1/16th of an inch thick where the least fraction of an inch up or down makes an appreciable difference. Furthermore, the armature hinge will often be found clogged with sticky paint daubed on *after test* "to give a finish."

Again, the brush which, on an overload, should make good contact with the brass pins connected to the no-volt coil, will often require to be pushed well home before functioning.

A very little extra trouble taken with the fitting and calibrating of this overload trip would undoubtedly result in a smaller bill for motor repairs.

Let us next consider the switch arm. Here we get a fruitful source of trouble, for, while it may be comparatively easy for an expert to start up a motor without "making the sparks fly," it must be borne in mind that the average machine hand is not only very inexpert, but is also not a little frightened of his starter, and will, at the least sign of sparks, loose the arm and thereby aggravate the trouble.

A properly designed starter switch arm should really be of the "slow movement" type, that is to say, it should only be possible to advance the arm from stud to stud at a uniformly slow rate. There are, of course, several types of these slow movement starters on the market, but as they are more costly than the ordinary kinds the latter are usually installed. Furthermore, engineers are generally endowed with an ingrained shyness of anything partaking of the nature of rat traps.

Before leaving the subject of switch arms it may be remarked that, if for any reason it has been found necessary to remove the arm, it is more often than not a job for two men to get it in position again owing to the way the spring is arranged. As far as the contact studs are concerned there is not much to complain of except that the first two or three studs should always be capable of renewal (*from the front of the starter*), for it is only those studs that suffer when sparking occurs. This remark only applies to the smaller types of starters, for on most of the heavier types renewable contacts are fitted throughout. Again, on the majority of starters there is nothing to indicate to the operator that the arm has left the "dead" studs, of which there are usually one or two, according to the size of the starter. It should be easy to mark the first "live" stud, or to make the "dead" studs of some hard insulating material; indeed the latter alternative has been adopted by some makers.

Most starter face-plates are simply slabs of plain slate which are rubbed over with an oily rag after being drilled. Now and again one comes across starters which have enamelled slate face-plates, but this is the exception rather than the rule. Enamelled slate is, of course, greatly preferable to plain, but here again the question of expense crops up, and the poor starter has to suffer.

So much for the externals: let us now consider the actual starter winding. Here the writer is confronted with weird memories of positive jungles of (more or less) insulated leads connected to resistance coils by little lumps of solder which *will* come unstuck owing to bad soldering. Here, too, we find perhaps a couple of coils within an eighth of an inch of one another when a "short" would mean the cutting-out of half the starting resistance; a shake is all that is needed to complete the "short" (and the starter will get that shake in transit), and bang goes the motor directly the arm is moved over.

The ideal system of connecting the various leads to the resistance coils has yet to be devised; some makers prefer to use copper bands, whilst others still swear by the soldered joint. Sometimes one even finds starters where the connections have been merely twisted round the tubes and left to take their chance.

Should any engineer be so misguided as to take a starter to pieces in order to repair burnt-out coils, he will find himself in the fortunate position of the man who took a grandfather clock to pieces, and who, upon trying to reassemble it, found that he had two or three wheels left over. However, the daring man who *does* try to repair coils will often find his stock of small nuts, washers, and screws considerably augmented from the reserve stock which is always to be found loose, inside the box.

The actual winding calculations of most types of starters appear to be fairly satisfactory, although here, too, we find some measure of thoughtlessness. It does not seem to be understood by winding calculators that 12, 13, or 14 S.W.G. resistance wire, if wound on, say, a $\frac{3}{8}$-in. mandrel, will make tolerably good springs, and that such coils are liable to buckle all ways after being placed in position.

The designer might also give some little thought to the kind of insulated wire he uses, and if beads be selected as the best means of insulating leads, these beads should certainly be of the unbreakable variety.

While on the subject of design the writer would appeal for the introduction of a starter winding in which burnt-out coils could be replaced in a reasonably short space of time. At present it takes three or four hours to do a job of this kind.

Perhaps the writer has been unfortunate, but he can honestly state that it has rarely been his luck to happen upon a motor starter of the enclosed or semi-enclosed type where it has been an easy matter to remove the cover, and, having removed it, to get it on again. The cover will also be found, in many cases, only just to clear the "live" parts of the overload coil.

The faults described above may also be traced in field regulators, with the exception, of course, of those faults peculiar to the releases.

Controllers are generally constructed in a much more robust manner, but even here we can trace evidence of careless design and manufacture. For instance, blow-out coils will often refuse to function just when their good offices are required, and the contact between fingers and segments is exceedingly sketchy in many instances.

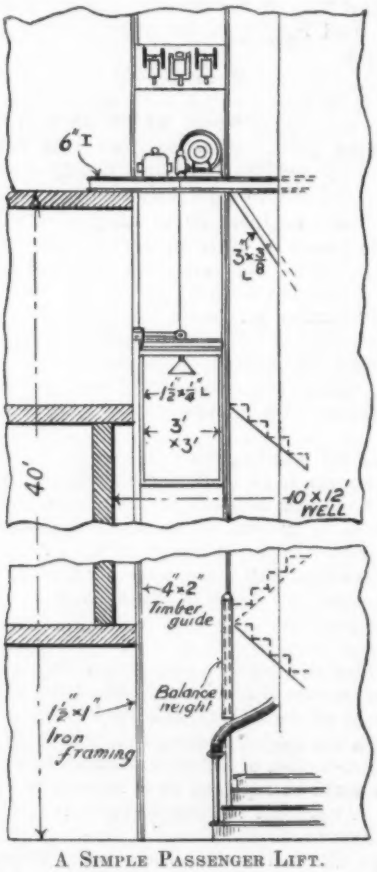
Then, in operating some types of controllers, a very strong jerk is required to pull the handle on to the "start" position. Once over the first notch, however, the handle will slip round all too easily.

In conclusion, it may be remarked that, while there are some really excellent designs of starters, &c., on the market, there are just as many of the other kind which hardly merit the term "design," and it must be understood that the complaints in the foregoing article are directed against the latter. It is indisputable that a little more time and thought given to the study of this all-important question of motor control would result in a far less worrying life for the plant engineer, and a longer period of usefulness for the motor.

A PUSH-BUTTON LIFT INSTALLATION.

By "F. A. P."

The following particulars of a small push-button-control passenger lift may be of interest to contractors who have the opportunity of pushing business in blocks of flats or similar buildings where no lift at present exists and where a fair-sized staircase makes a shaft practicable. Even where a comparatively small staircase only exists, a lift to carry two passengers is generally possible without encroaching on the rooms.



A Simple Passenger Lift.

The premises in question were originally fitted with a tradesman's or plate lift, which was worked by pulling on a rope. Owing to being carelessly handled and overloaded with such things as sacks of coal, for which it was never intended, it was constantly out of order, and was also the cause of several minor accidents, and gradually fell into disuse.

Some time ago a simple push-button, low-speed lift was installed, and has worked satisfactorily for six years without an accident. It is frequently used by tradesmen's boys, but not by children; in places where there were children it would probably be necessary to fix the push buttons out of their reach. What little trouble has arisen has been caused by passengers letting their luggage or umbrellas project beyond the car, causing slight damage to the casing or temporary stoppage of the lift, but no personal injury has been caused, so we may consider these lifts quite safe for ordinary use without an attendant.

The whole installation cost about £400 (in 1914), and is in constant use daily, the number of double journeys amounting to over 100 per day. It is oiled and examined about once or twice a month, and has a good overhaul every other year.

The cost of electricity, repairs, and maintenance comes out at about £25 per annum, making the cost of a double journey under ¼d., which we may consider a negligible expense considering the convenience.

Very little structural alteration was required when installing, a hole being cut round the original small lift and trimming joists put in to take the load on the joists cut through. As the topmost floor is not served by the lift, the motor was placed on the floor level with the control gear above, so that all parts are readily accessible for overhauling or attention.

The motor stands on steel joists stiffened by an angle bracket let into the wall of the building, and is of 4-h.p., ½-hour rating, working at 900 revs. per minute, giving the car a speed of about 100 ft. per minute.

The usual causes of trouble, if not inspected regularly, are due chiefly to the plungers of the solenoids on the control panel sticking, and also to the gates not fully closing when not properly oiled or through the guides not being kept free from dust. In the latter case, the safety switches fitted on the door framework, which break the circuit when the door is open, are not thrown sufficiently far over to make contact if the door is not quite closed, thus preventing the lift from working. A fortnightly inspection has been found sufficient to prevent these troubles.

The motor is geared by a worm and worm wheel to the 5-grooved pulley over which the car and counterweight are hung, the whole forming a compact unit on one bedplate; a spring-controlled brake with a pull-off solenoid is fitted between the motor and gear box. The shaft is cased in with strong wire mesh, but can be boarded in if preferred. The accompanying illustration shows the general arrangement, showing how simple is the lay-out.

Considerable business should be done in fitting lifts of this kind, and contractors might do worse than take up this work, the installation of the smaller types being comparatively simple. Landlords should be induced without much difficulty to go to the initial expense, if the increased letting value of the upper floors, when a lift is fitted, is pointed out.

The example described has paid for itself in a few years, besides adding to the value of the property. These are points that should be put before prospective users, who naturally only wish to spend money on sound business propositions where a return can be anticipated with safety.

De-Control of Canals.—Sir E. Geddes (Transport Minister) said, in the House of Commons, on July 26th, that the controlled canal companies had been informed that control would cease on August 31st. He was prepared forthwith to take possession of the controlled undertakings, and to set in motion the machinery for increasing the tolls and charges. He had no power to increase the charges until the matter had been referred to the Rates Advisory Committee. The Government was desirous of maintaining the canals as an effective transport agency, and would consider favourably applications for advances to meet working expenses until authority could be given to increase charges. He hoped to give this authority before the end of September. It was impossible to come to a decision on canal charges until they saw where they were on the railway rates question. Although the subsidy was coming to an end, they proposed to give the canals temporary aid, under a strict arrangement with the Treasury, in order that they might keep themselves going until they could overhaul their arrangements. They would be merely taken over in the technical sense, to enable them legally to put up their charges.—*Birmingham Post.*

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Ediswan Cooking Apparatus.

Some new lines of heating and cooking apparatus, some of which are illustrated herewith, have recently been put upon the market by the Edison Swan Electrical Co., Ltd., of Ponders End, Middlesex. The boiling plate, fig. 3, is 8 in. in diameter by 3.75 in. high, consumes 1,000 watts, and can be supplied either for one or three-heat control. The top and base are of cast iron, the top being ground and polished bright to give a pleasing appearance; the remainder of the plate is finished in black enamel. The combination saucepan, fig. 4, is made of copper tinned inside and heavily nickel plated and polished outside. Its capacity is two pints and its loading 500 watts with single-heat control. The container can be used for heating milk, porridge, &c., its capacity being 1.5 pints; the egg cruet holds five eggs. The fish frier, fig. 1, is made of entirely welded steel plates supported on a sheet metal casing with a wired top and bottom; the size of the pan being 24 in. by 18 in. by 6 in. deep. The elements are

Fig. 1.—Fish Frier.

Fig. 3.—Boiling Plate.

Fig. 4.—Combination Saucepan.

easily replaced by lifting the pan, to which the elements and connections are all fixed, from the casing. A drip pan and shelf are provided for draining the fish after it has been cooked. The loading is 5.8 kw., and the two or three-heat control is by rotary switches giving 7 degrees of heat. The frier is ready for use 20 minutes after it has been switched on.

The "Quidos" Electric Lamp Food Warmer.

The electric food warmer and foot warmer devised by Mr. Leoline Edwards, of 81, St. Margaret's Road, Twickenham, which we described in our issue of March 12th last, p. 350, has been greatly improved by making it in the form of a jacketed cylinder. Using a single 2½-candle carbon lamp, the device was actually rather too warm for use as a foot-warmer in bed; the jacket remedies this, and

Fig. 2.—The "Quidos" Food and Foot Warmer.

at the same time increases the efficiency of the apparatus as a food warmer. In other respects it is essentially the same; as shown in fig. 2, it contains a slider carrying a small lamp, and when standing vertically it can be used to keep baby's food at a temperature of 100 deg. F. all night, while sufficient light escapes round the pan to serve as a night-light and indicate its exact position. For use as a foot warmer it is covered with a flannel jacket and laid on its side.

It is remarkable to how many uses this simple device can be applied. It serves to vaporise scent, disinfectants, and the volatile substances which allay the irritation of the breathing passages in whooping-cough, &c.; it can be put in a cupboard to air clothes, used as a reading lamp with a suitable wire-frame shade, and as a plate warmer; placed in a wardrobe, with a light carbon compound in a dish, it fumigates furs, &c., and drives out moths. When it is used as a foot warmer, a switch can be provided with which it can be turned on or off without rising, and under all conditions it is clean, dry, odourless, and free from fire risk—which cannot be said of the customary devices used for the above purposes. It is supplied in various finishes—tin, nickel, copper, and brass. A 2½-candle lamp takes only 10 watts; larger sizes can be used if desired.

The "Plexsim" Electric Iron.

The new Plexsim electric iron, which is made by Messrs. Simplex Conduits, Ltd., of Garrison Lane, Birmingham, is about 5.5 lb. in weight, and is well finished in nickel plate all over, including the sole plate. Each iron is sent out complete

Fig. 5.—Plexsim Electric Iron.

with three yards of flexible cord and a lampholder connector, and, as seen from fig. 5, is fitted with a firm and safe self-contained stand. The special points about the iron are that its

point is always hot, and the handle, the ends of which are shrouded to prevent burning, is always cool. The heating element is designed with ample emissive surface, and the connector and round terminals are made to the dimensions recommended by the Engineering Standards Association. The double spring fixed to the connector is claimed not only to keep the flexible out of the way when the iron is in use, but also to prevent those sharp bends in it near the connector which are so frequently the cause of trouble. Further, the flexible cord itself is of special design; among the fine strands of copper wire which form the conductor are several stronger strands of hard spring steel wire. These strands reduce the flexibility but little, and add greatly to its durability. The guarantee attached to each iron reads as follows: If an element fails when in use on the voltage for which it is marked, the makers will supply and fit a new element free of cost at any time; there is no time limit.

REVIEWS.

The Baudôt Printing Telegraph System. By H. W. Pendry. Second edition, revised. 184 pages. London: Sir Isaac Pitman & Sons, Ltd. Price 6s. net.

The first edition of this book appeared in 1913. The British Post Office administration had at that time considerably extended its use of the Baudôt system of machine telegraphy. From being employed solely on circuits to the Continent it had been adopted also for important inland telegraph channels, and had proved itself of great utility in its new sphere of action. As a result of this extension, a knowledge of the Baudôt system, till then more or less confined to officials in the cable room of the Central Telegraph Office, became essential to a much wider circle of telegraph men. It was to meet this demand that the first edition of Mr. Pendry's book was produced, and it certainly did so in a most satisfactory manner. Without going into advanced theoretical considerations, it gave a complete account of the whole system, including the then recent advance made by the British Post Office of duplexing the Baudôt, and nothing further was needed by a man in daily touch with the actual apparatus under working conditions for him to obtain a thoroughly good grasp of the whole system.

During the period which has elapsed since the appearance of the first edition the development of the Baudôt system by the British Post Office has been continued, and in the second edition the earlier book has been brought up to date to include these recent advances.

The book is divided into eleven chapters. After a brief introduction, in which the fundamental essentials of a multiplex printing telegraph system are discussed, the various pieces of apparatus which comprise the Baudôt system are described in detail. Chapter II deals with the distributor, Chapter III with the keyboard, Chapter IV with the receiver, and Chapter V with the various relays used in the system. Then follows a chapter on the electrical connections, with a description of the method of synchronising the apparatus at the two communicating stations, and a discussion of the effect of the line capacity in retarding and distorting the signals. The following four chapters deal respectively with Baudôt double, quadruple, duplex Baudôt, and Baudôt repeaters, while in the final chapter is given an account of the faults most likely to occur, with their remedies, and of the manner in which the adjustments of the various parts of the apparatus should be made.

The portions of the book which deal with essentially practical details are excellent. Some of the theoretical points, however, are treated in a rather loose and illogical manner, and it would be a great improvement if in subsequent editions of the book, which will no doubt be required, these points could be revised.

For instance, in the description of the theory of the action of the Baudôt governor, the following sentences occur:—

"Centrifugal force may be defined as that force which tends to throw a mass off from a centre" (the fact that the mass is rotating is not mentioned), "and the *point* from which the weight flies is known as the *axis* of rotation."

"It should be remembered also that the *tendency* towards an increase in the speed of rotation of the weight is restrained by the fact that the amount of centrifugal force *required* varies not in proportion to the increased speed, but to the square of that speed."

The writer then gives the formula $f = ws^2a$ for the value of the centrifugal force, where "w" is defined as the mass or weight (!) of the rotating body, and "s" its *speed*! The correct formula, of course, is $f = ms^2/a$, where m is the *mass* of the body, and s the speed of its centre of gravity. The formula given in the book holds good if w is the mass (not the weight) of the body, and s its *angular* velocity.

A little further on, in the same section of the book, the writer says:—

"In order that the distributor speed shall remain constant it is essential that the resistance shall uniformly balance the energy"!

He also speaks of "the energy of machinery" in a train of wheels!

In the diagram of the Gulstad relay (fig. 50) the actual receiving apparatus is not shown. It would be an improvement if this were inserted.

The following portion of the paragraph on the effect of the line conditions on the signals is susceptible of considerable improvement:—

"The impulses may be considered as transmitted by undulations of electromagnetic waves. When passing through a non-inductive resistance, such as that of an ordinary resistance box, the deteriorating influence experienced by an impulse is simply a falling away of its magnitude, or attenuation, due to the ohmic resistance"! The writer appears to be unaware that the attenuation along a pure resistance is nil—there is no "falling away" at all of the magnitude of an impulse, but, on the contrary, the amplitude is the same throughout the whole length of the resistance.

To continue the same paragraph:—

"But on all except very short lines the transmission waves suffer from the effects of capacity and inductance, *the one producing a 'lead' and the other a 'lag'* in the wave." The writer appears to have an extremely hazy conception of the action of line capacity on a transmitted impulse. He is mixing up the effect of *series* capacity in an alternating current circuit with that of capacity *between* the two sides of the circuit, or, in the case of an ordinary telegraph circuit, between line and earth.

We would strongly advise the writer to modify the points we have indicated above, which, as they stand, somewhat mar what is otherwise a most excellent book.

The Manufacture of Chemicals by Electrolysis. By Arthur J. Hale, B.Sc., A.I.C. Pp. 89. London: Constable & Co., Ltd., 1919. Price 6s. net.

This monograph forms a section of a treatise on electrochemistry which is being issued by Messrs. Constable under the general editorship of Mr. Bertram Blount. The idea itself is an excellent one, but judging from the present instalment it does not appear that the editor has conceived very clearly the kind of reader he has in view. In our opinion, the treatise should be a really comprehensive one, written by and for the specialist, something in fact on the lines of the German monographs on electrochemistry—if less ponderous—that used to be issued by Kapp of Halle. The present volume is much too general, and the treatment too "skimpy" (if we may be pardoned the use of this expressive term) to be of much use to the specialist, nor, we think, will it appeal very strongly to the general technical reader, except that it will reveal to him in a cumulative way the quite astonishing number of chemical products that either are or can be made by electrolysis.

The author confines himself chiefly to electrolytic oxidation or reduction products, such as per-salts, hydroxylamine, nitrates, and hydrosulphites, metallic oxides (chiefly pigments), and organic compounds. A chapter is devoted to the production of hydrogen and oxygen, in which, however, not much reference is made to the recent developments, and there is a short chapter on electro-osmotic and electro-colloidal processes, in which a good deal of interesting matter might have been included. There is no reference to the process for purifying clay that is now finding industrial application. The manufacture of alkalis is not dealt with; it will doubtless have a special volume devoted to it.

The compilation is a very industrious one, and copious references are given, but a readable text-book cannot be written by merely stringing together short references, or by uncritical descriptions of patent specifications. Nevertheless, the book will serve a useful purpose in indicating both to the manufacturing chemist and the engineer how very potent an agent electricity may be in fields not at present usually associated with the electrical method of applying energy.

Storage Battery Practice. By Robert Rankin, B.Sc., M.I.E.E. Pp. 169. London: Sir Isaac Pitman & Sons, Ltd., 1919. Price 7s. 6d. net.

This very useful handbook is intended to guide the user of accumulators in their installation and operation. It therefore fills an undoubted gap in our technical literature, for most existing books on storage batteries treat of their manufacture and characteristics rather than of their erection and use. The engineer with batteries under his charge will find Chapters III, V, and VI, in particular, dealing with "installation and setting to work," "the practical working of cells," and "overhauls and repairs," full of wise guidance and useful information. The failures of accumulators to attain what is expected of them in capacity and life would almost disappear if the man-in-charge who is really responsible for the failures, erected and treated his cells in the manner prescribed by the author. More emphasis should, however, have been laid on the necessity for perfect cleanliness—freedom from dust and fumes of all kinds—in the battery room. Where accumulators are used in works, as apart from central stations, there is a real danger of their being allocated to a dark and dirty portion of the factory. The writer knows of more than one battery which has come to an untimely end through not being sufficiently protected from deleterious chemicals in the form of spray, dust, or fumes. Ammoniacal

fumes have been known to destroy a battery in an incredibly short time.

A chapter that will be found of general interest to the electrical engineer is that on "Uses of Stationary Batteries," where it is shown how useful a part the accumulator may play in the central station as a load equaliser. The various methods of control by means of boosters are described, and the examples given of the economies actually obtained on a fluctuating load by the installation of a battery and booster, indicate very forcibly the advantages of the system. We miss, however, a statement as to the relative capital cost involved.

Mathematics for Engineers. Part II. By W. N. Rose, B.Sc. Pp. 419, figs. 142. London: Chapman & Hall. Price 13s. 6d. net.

This is the second volume of Mr. Rose's book on mathematics which is designed to "embrace all the mathematical work needed by engineers in their practice, and by students in all branches of engineering science." The first volume, which we reviewed in our issue of August 23rd, 1918, covered the preliminary mathematics leading up to the calculus, and the present volume, with the exception of two chapters, is devoted to the study of differential and integral calculus and its application to engineering theory and practice.

There is no doubt that a treatise on the calculus from the engineer's standpoint will be welcomed by all types of engineering students. Some of the recent books on practical mathematics have touched upon the subject in a practical manner, but there is still room for the more thorough treatment here given by Mr. Rose. It is in fact a standing reproach that our engineering mathematics have been left to the pure mathematician, who has only given an engineering bias to his professional mathematical gymnastics in response to the insistent demand made by engineering students.

The thoroughgoing treatment of engineering problems by means of the calculus has seldom been part of the training of the engineer—the mathematician has forged the tool, but its use has been restricted to problems of academic rather than practical interest. It is therefore good to find a sound text-book of mathematics, written *by* an engineer *for* engineers, which, while avoiding the academic subtleties of the pure mathematical school, does not omit to emphasise the scientific basis upon which all sound mathematics is built. As the author puts it in his preface: "Much thought has been given to the elimination of all rules and processes of academic interest only; but the fact of the importance and the necessity of logical reasoning has not been overlooked."

The notation and first principles of the differential calculus are very rightly introduced by using the ideas of velocity and acceleration already familiar to every engineering student; in fact we note with satisfaction that the symbols dy and dx do not appear until many pages have been traversed in which ds, dt, and dv appear with marked frequency.

Having broken the ice with commendable judgment in Chapter I, the author plunges into the theory of differentiation in Chapter II. Every rule is illustrated by a definite engineering problem—expansion of gases, temperature coefficients, deflection of beams, and inductance effects all being used to provide material for practical differentiation. Then, having developed the rules for the differentiation of algebraic, logarithmic, and trigonometrical functions, a chapter is devoted to the solution of problems on maximum and minimum values, and the calculation of small corrections.

The study of integration is commenced in Chapter V. The fact that it is of far more extensive application and more difficult of comprehension has led the author to illustrate the fundamental principles of integration at considerable length. Graphical methods, and the interpretation of integrals by graphical constructions, are given a fair share of attention, but the conception of integration as an essentially algebraic process, often capable of graphical illustration, but in no wise dependent upon it, has been emphasised throughout the treatment. The Conradi integraph and the proof of Simpson's rule are introduced in the first chapter of this section, and serve to give a flavour of practicality to the very earliest stages of the integral calculus. All the standard methods and artifices used in integration are amply illustrated, and a most useful list of integrals likely to be of service is included at the end of Chapter VI.

The next 80 pages are devoted to the applications of integration to the determination of mean values, areas, volumes, centroids, and moments of inertia. No less than 42 examples are fully worked out in the text, and over 80 other problems are proposed for solution. Seeing that it is to such problems that the calculus is most frequently applied Mr. Rose has done well to deal with it so thoroughly, and he has been equally happy in his choice of the worked out questions and those which he has left for the student to work out for himself.

At this point a short but useful chapter on polar co-ordinates is inserted. Their employment in the finding of areas is described and illustrated by means of the Rousseau diagram for the determination of mean spherical candle powers, Fleming's method for finding R.M.S. values, and in the theory of the Amsler planimeter.

The chapters on simple differential equations and applications of the calculus conclude a treatment of the calculus which is unique in its practical outlook and wealth of illustrative examples. All the types of differential equations with which the engineer has to do are fully explained and applied to problems in mechanics, electricity, and heat. A brief summary of the final chapter will serve to indicate both the thoroughness with which the author has covered the ground and the practical nature of the problems tackled. In thermodynamics—expressions for the work done during adiabatic and isothermal expansions, the entropy of water and steam, the efficiency of a Rankine cycle under varying conditions; in mechanics—examples relating to loaded beams, shearing stress in beams, the catenary, oscillating systems, stresses in thick cylinders, tension in belts, and centres of pressure; in applied electricity—problems on transients, and circuits with inductance and capacity.

The chapter on harmonic analysis deals in a simple and clear manner with Fourier's theorem and its application to the resolution of periodic functions.

To the engineer the final chapters on spherical trigonometry and mathematical probability will not make the same appeal as the earlier pages. The surveyor will no doubt find in them much useful matter, but we doubt whether Mr. Rose has been altogether wise in burdening his book with these 30 pages. The examples have altogether too academic a setting, and we fear that even the "exclusive events" mentioned in Chapter XIII will fail to attract the man for whom the rest of the book is so obviously written.

An excellent appendix of mathematical tables, including natural and logarithmic trigonometrical functions and tables of Napierian logarithms, completes a volume for which we have much of commendation and little of criticism—a text-book which will rank high among modern treatises on practical higher mathematics.—P.H.S.K.

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

19,808. "Commutators." V. G. Apple. July 9th. (United States, February 14th, 1918.)

19,809. "Armatures." V. G. Apple. July 9th. (United States, February 14th, 1918.)

19,810. "Moulds for plastic material." V. G. Apple. July 9th. (United States, May 17th, 1918.)

19,811. "Conductor members for vibration-current controlling regulators." V. G. Apple. July 9th. (United States, February 14th, 1918.)

19,812/3. "Dynamo-electric machines." V. G. Apple. July 9th. (United States, February 14th, 1918.)

19,814. "Armature cores for dynamo-electric machines." V. G. Apple. July 9th. (United States, March 8th, 1918.)

19,815. "Dynamo-electric machines." V. G. Apple. July 9th. (United States, March 21st, 1918.)

19,816. "Armatures." V. G. Apple. July 9th. (United States, April 27th, 1918.)

19,817. "Armatures." V. G. Apple. July 9th. (United States, May 7th, 1918.)

19,818. "Inductor elements for dynamo-electric machines." V. G. Apple. July 9th. (United States, May 20th, 1918.)

19,819. "Armatures." V. G. Apple. July 9th. (United States, May 20th, 1919.)

19,820. "Terminal-bending tool of armature conductors." V. G. Apple. July 9th. (United States, December 23rd, 1918.)

19,821. "Current-controlling devices." V. G. Apple. July 9th. (United States, January 17th, 1919.)

19,822. "Armatures for dynamo-electric machines." V. G. Apple. July 9th. (United States, September 15th, 1919.)

19,837. "Switchgear for electric motors." P. S. Brook and J. A. Hirst. July 9th.

19,842. "Incandescent electric lamps." E. Y. Robinson. July 9th.

19,844. Self induction coils, &c." Soc. Française Radio-Electrique. July 9th. (France, May 20th, 1915.)

19,845. "Electro-magnetic wave receiving systems." Soc. Française Radio-Electrique. July 9th. (France, July 1st, 1915.)

19,849. "Electric arc lamps." Siemens-Schuckertwerke. July 9th. (Germany, April 5th, 1917.)

19,850. "Electrically-driven vehicles." British Thomson-Houston Co. July 9th. (United States, June 9th, 1915.)

19,851. "Means for controlling electric currents, &c." British Thomson-Houston Co. July 9th. (United States, February 5th, 1914.)

19,852. "Dynamo-electric machines." British Thomson-Houston Co. July 9th. (United States, January 16th, 1917.)

19,853. "Electric motors." British Thomson-Houston Co. July 9th. (United States, February 14th, 1918.)

19,855. "Electric regulating systems." British Thomson-Houston Co. July 9th. (United States, July 10th, 1918.)

19,856. "Wireless receiving systems." British Thomson-Houston Co. July 9th. (United States, June 15th, 1918.)

19,857. "Electric starting systems for internal-combustion engines." British Thomson-Houston Co. July 9th. (United States, January 16th, 1917.)

19,858. "High-frequency alternators." British Thomson-Houston Co. July 9th. (United States, September 23rd, 1916.)

19,859. "Means for transforming direct current." British Thomson-Houston Co. July 9th. (United States, December 29th, 1913.)

19,860. "Enclosed electric arc devices." British Thomson-Houston Co. July 9th. (United States, October 30th, 1915.)

19,861. "Wireless receiving systems." British Thomson-Houston Co. July 9th. (United States, October 11th, 1917.)

19,862. "Enclosed electric arc devices." British Thomson-Houston Co. July 9th. (United States, October 30th, 1915.)

19,863. "Dynamo-electric machines." British Thomson-Houston Co. July 9th. (United States, October 13th, 1915.)

19,864. "Electron discharge devices." British Thomson-Houston Co. July 9th. (United States, October 31st, 1917.)

19,865. "Electrically-driven vehicles." British Thomson-Houston Co. July 9th. (United States, July 24th, 1914.)

19,866. "Electric motors." British Thomson-Houston Co. July 9th. (United States, February 19th, 1918.)

19,867. "Electron discharge apparatus." British Thomson-Houston Co. July 9th. (United States, October 16th, 1913.)

19,868. "Wireless signalling systems." British Thomson-Houston Co. July 9th. (United States, December 29th, 1913.)

19,885. "Wireless telephony systems." Soc. Française Radio Electrique. July 9th. (France, February 24th, 1917.)

19,886. "Multiplex telephony." Ges. für Drahtlose Telegraphie. July 9th. (Germany, December 14th, 1918.)

19,899. "Apparatus for generating high-frequency currents for wireless telegraphy, &c." Ges. für Drahtlose Telegraphie. July 9th. (Germany, January 19th, 1915.)

19,900. "Arrangement for operating direct-current relays by electrical oscillations." Ges. für Drahtlose Telegraphie. July 9th. (Germany, February 8th, 1916.)

19,901. "Generation of electric oscillations." Ges. für Drahtlose Telegraphie. July 9th. (Germany, September 28th, 1917.)

19,902. "Wireless telegraph transmitters." Ges. für Drahtlose Telegraphie. July 9th. (Germany, December 22nd, 1917.)

19,903. "Cathode-ray tubes." Ges. für Drahtlose Telegraphie. July 9th. (Germany, January 9th, 1918.)

19,904. "Wireless telegraph receivers." Ges. für Drahtlose Telegraphie. July 9th. (Germany, April 9th, 1914.)

19,905. "Cascade high-frequency amplifiers." Ges. für Drahtlose Telegraphie. July 9th. (Germany, July 25th, 1918.)

19,906. "Cathode-tube generators." Ges. für Drahtlose Telegraphie. July 9th. (Germany, October 25th, 1918.)

19,907. "Wireless telegraph receivers." Ges. für Drahtlose Telegraphie. July 9th. (Germany, September 10th, 1915.)

19,908. "Electric discharge tubes." W. Kassel. July 9th. (Germany, December 23rd, 1916.)

19,931. "Electricity meters." Siemens-Schuckertwerke. July 9th. (Germany, March 15th, 1918.)

19,934. "Dynamo-electric machines." Siemens-Schuckertwerke. July 9th. (Germany, June 15th, 1918.)

19,936. "Voltametric electricity meters." Siemens-Schuckertwerke. July 9th. (Germany, March 11th, 1919.)

19,937. "Manufacture of stranded conductors for electrical machines." Siemens-Schuckertwerke. July 9th. (Germany, December 29th, 1917.)

19,942. "Primary batteries." C. Fery. July 9th. (France, December 1st, 1914.)

19,989. "Subaqueous sound signals." Signal Ges. July 9th. (Germany, December 16th, 1914.)

19,990. "Subaqueous sound signals." Signal Ges. July 9th. (Germany, May 8th, 1915.)

19,991. "Submarine sound producing devices." Signal Ges. July 9th. (Germany, June 14th, 1915.)

19,992. "Sound producing or receiving devices." Signal Ges. July 9th. (Germany, February 29th, 1916.)

19,993. "Subaqueous sound producer or receiver." Signal Ges. July 9th. (Germany, November 1st, 1916.)

19,994. "Submarine sounding apparatus." Signal Ges. July 9th. (Germany, March 10th, 1917.)

19,995. "Sound apparatus." Signal Ges. July 9th. (Germany, August 6th, 1917.)

19,996 "Subaqueous sound producers, &c." Signal Ges. July 9th. (Germany, November 27th, 1917.)

19,997. "Subaqueous sound producers, &c." Signal Ges. July 9th. (Germany, February 25th, 1918.)

19,998. "Polarised electro-magnetic sound apparatus." Signal Ges. July 9th. (Germany, May 4th, 1918.)

19,999. "Polarised electro-magnetic sound apparatus." Signal Ges. July 9th. (Germany, May 4th, 1918.)

20,000. "Sound-transmitting arrangement." Signal Ges. July 9th. (Germany, August 12th, 1918.)

20,001. "Submarine sound receivers." Signal Ges. July 9th. (Germany, August 12th, 1918.)

20,002. "Submarine sound receivers." Signal Ges. July 9th. (Germany, October 26th, 1914.)

20,003. "Listening devices." Signal Ges. July 9th. (Germany, March 20th, 1917.)

20,004. "Electric switching apparatus." Auto-Combinator Soc. Anon. July 9th. (Germany, April 22nd, 1919.)

20,009. "Signalling systems." British Thomson-Houston Co. July 9th. (U.S., October 14th, 1919.)

20,030. "Electron amplifiers." British Thomson-Houston Co. July 9th. (U.S., January 3rd, 1919.)

20,031. "Means for obtaining unidirectional potential differences or current of constant value." British Thomson-Houston Co. July 9th. (U.S., December 22nd, 1915.)

20,033. "Generation of high frequency oscillations." British Thomson-Houston Co. July 9th. (U.S., June 3rd, 1918.)

20,034. "Electron discharge apparatus." British Thomson-Houston Co. July 9th. (U.S., October 28th, 1915.)

20,035. "Electron discharge apparatus." British Thomson-Houston Co. July 9th. (U.S., October 29th, 1913.)

20,036. "Electron discharge apparatus." British Thomson-Houston Co. July 9th. (U.S., December 29th. 1913.)

20,044. "Magneto casing." C. Rouguet. July 9th. (France, April 26th, 1919.)

20,045. "Commutator box." C. Rouguet. July 9th. (France, April 26th, 1919.)

20,048. "Device for closing an electric circuit by magnetic induction." W. Augereau. July 9th. (France, August 1st, 1916.)

20,058. "Electric switches." P. Aufranc. July 9th. (France, July 13th, 1918.)

20,090. "Transmitters of high frequency oscillations." Ges. Für Drahtlose Telegraphie. July 9th. (Germany, November 6th, 1918.)

20,091. "Multiple telephone wires." Ges. für Drahtlose Telegraphie. July 9th. (Germany, May 27th, 1919.)

20,092. "Reception of continuous electric oscillations." Ges. für Drahtlose Telegraphie. July 9th. (Germany, October 15th, 1915.)

20,093. "Electric current amplifiers." Ges. für Drahtlose Telegraphie. July 9th. (Germany, November 16th, 1915.)

20,094. "Electric discharge tubes." W. Kossel. July 9th. (Germany, March 1st, 1917.)

20,116. "Dynamo electric machines." W. Boin. July 9th. (France, October 13th, 1917.)

20,145. "Choking coil." Allgemeine Elektricitäts-Ges. July 9th. (Germany, July 10th, 1914.)

20,153. "Driving system for alternating current meters." Allgemeine Elektricitäts-Ges. July 9th. (Germany, January 14th, 1919.)

20,177. "Starter for internal combustion engines." Soc. des Phares et Equipments Electriques. July 9th. (France, June 17th, 1919.)

20,226. "Telephony." Dr. E. F. Huth Ges. & S. Loewe. July 9th. (Germany, December 31st, 1915.)

20,227. "Telephony." Dr. E. F. Huth Ges. & S. Loewe. July 9th. (Germany, November 28th, 1916.)

20,228. "Vacuum tubes." Dr. E. F. Huth Ges. July 9th. (Germany, March 30th, 1918.)

20,229. "Aerial conductors for wireless telegraphy." Dr. E. F. Huth Ges. July 9th. (Germany, July 1st, 1915.)

20,230. "Wireless messages." Dr. E. F. Huth Ges. July 9th. (Germany, October 21st, 1914.)

20,231. "Arrangement for carrying wireless stations." Dr. E. F. Huth Ges. July 9th. (Germany, October 30th, 1913.)

20,232. "Reels, &c., for winding and unwinding aerial conductors." Dr. E. F. Huth Ges. July 9th. (Germany, January 16th, 1918.)

20,233. "Reels, &c., for winding and unwinding aerial conductors." Dr. E. F. Huth Ges. July 9th. (Germany, May 6th, 1918.)

20,234. "Sources of electrical energy for use in aircraft." Dr. E. F. Huth Ges. July 9th. (Germany, February 1st, 1916.)

20,235. "Wireless receiving apparatus." Dr. E. F. Huth Ges. & S. Loewe. July 9th. (Germany, December 20th, 1915.)

20,236. "Method of tuning the sending connections for wireless telegraphy." Dr. E. F. Huth Ges. & S. Loewe. July 9th. (Germany, September 18th, 1915.)

20,237. "Aircraft stations for wireless telegraphy." Dr. E. F. Huth Ges. July 9th. (Germany, December 4th, 1914.)

20,238. "Coils for high frequency purpose." Dr. E. F. Huth Ges. July 9th. (Germany, November 29th, 1916.)

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1916.

3,543. "Apparatus for recording and reproducing sounds and electric signals." E. Russell Clarke. March 9th, 1916. (Complete accepted February 5th, 1920. Patent sealed February 5th, 1920.) (145,805.)

1918.

21,922. "Methods and apparatus for the detection and generation of sound or like waves." R. A. Fessenden. December 31st, 1917. (145,812.)

1919.

5,047. "Electron discharge apparatus, and process of operating the same." Connecticut Telephone & Electric Co. March 23rd, 1918. (124,721.)

7,715. "Synchronous operation by electrical means of two or more mechanisms." A. Robinson & Co., J. F. Gill, and J. N. Chaviara. March 27th, 1919. (145,835.)

7,722. "Electric arc apparatus employed in the generation of oscillating currents." W. S. Entwistle. March 27th, 1919. (145,837.)

7,740. "X-ray apparatus." British Thomson-Houston Co. (General Electric Co.). March 27th, 1919. (145,839.)

8,163. "Telephonic repeaters." C. Robinson and R. M. Chamney. April 1st, 1919. (145,869.)

8,278. "Dynamo-electric machines." R. W. Myers. April 2nd, 1919. (145,879.)

8,312. "Systems of electric power transmission. British Thomson-Houston Co. (General Electric Co.). April 2nd, 1919. (145,881.)

8,449. "Machines for making bobbins for electric batteries." National Carbon Co. October 1st, 1917. (125,382.)

8,795. "Electric furnaces." R. Steiger. April 9th, 1918. (125,391.)

9,745. "Electric fault-detecting devices." E. J. Simon. April 16th, 1919. (145,907.)

10,045. "Commutators for dynamo-electric machines." H. Chitty. April 22nd, 1919. (Patent of addition not granted.) (145,909.)

10,249. "Miners' electric lamps." Haslam & Stretton, T. Stretton, and J. W. Jones. April 24th, 1919. (145,913.)

11,921. "Electro-magnetic controlling devices." Soc. Anon. des Etablissements L. Blériot. August 28th, 1918. (131,875.)

13,751. "Electric radiators." J. R. Quain. May 30th, 1919. (145,950.)

15,301. "Electric voltage regulator." British Thomson-Houston Co. (General Electric Co.). June 18th, 1919. (145,966.)

15,748. "Electric induction apparatus." British Thomson-Houston Co. (General Electric Co.). June 23rd, 1919. (145,972.)

16,248. "Insulation of the leads passing through the case of electrical measuring instruments. W. H. L. Wood and Metropolitan-Vickers Electrical Co.). June 27th, 1919. (145,975.)

16,256. "Fault localisation for underground electric cables." C. W. Kay and Callender's Cable & Construction Co.). June 27th, 1919. (145,976.)

18,004. "Electric furnace." E. Piquerez. September 2nd, 1918. (132,232.)

18,647. "Electric plug couplings." A. Chalmers and W. F. Mitchell. July 28th, 1919. (145,992.)

18,879. "Apparatus for testing of magnetos and sparking-plugs as used for the ignition of internal-combustion engines." J. M. Tumbelty. July 30th, 1919. (145,995.)

20,137. "Incandescent electric lighting apparatus." C. von der Weid. September 13th, 1918. (132,501.)

22,288. "Current-reversing devices for dynamos turning in both directions." F. Mauron. September 10th, 1918. (132,517.)

23,193. "Electric switches for signalling and like purposes." D. Desplats. September 20th, 1919. (146,013.)

24,495. "Protecting means for ignition coils used in connection with explosion motors." Scintilla. October 19th, 1918. (134,201.)

25,712. "Electro-magnetic clutches." H. M. Beyer. March 14th, 1919. (140,366.)

27,941. "Electric regulators." A. E. White (U.S. Light & Heat Corporation). November 11th, 1919. (146,033.)

28,100. "Sparking plugs for internal-combustion engines." J. Atkinson, S. G. Atkinson, W. Atkinson, and R. Atkinson. November 12th, 1919. (146,034.)

29,547. "Electric condensers." W. E. Barber. November 27th, 1919. (146,038.)

30,495. "Efectric motor controllers." C. R. Galer. December 5th, 1919. (146,041.)

32,124. "Sparking plugs for internal combustion engines." M. Eyquem. February 4th, 1919. (138,596.)

1920.

1,500. "Devices for preventing the accidental or unauthorised starting of electrically-ignited internal-combustion engines." R. Bosch Agt.-Ges. March 27th, 1916. (137,865.)

3,940. "Ignition magnetos for internal-combustion engines." Fabriques des Montres Zenith. June 11th, 1919. (144,608.)

4,390. "Sparking plugs." J. L. Platel. September 28th, 1919. (138,934.)

6,318. "Switchboard arrangements particularly for field telephone apparatus." Siemens & Halske, Akt.-Ges. March 4th, 1916. (139,779.)

7,365. "Safety device for electric generators." Siemens-Schuckertwerke. October 23rd, 1918. (140,100.)